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Climate Change Plan for Canada

Achieving our Commitments Together

Meeting this challenge requires a national effort – one that engages all Canadians and every region of the country.



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Commitments Together



Climate Change Plan for Canada



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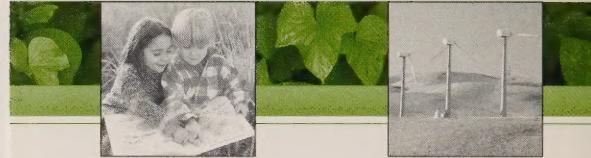
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The Science

There is international scientific consensus about the reality of climate change. Human activities – particularly those associated with energy use and deforestation – are accelerating the concentration of greenhouse gases in the atmosphere. The global community faces the likelihood of increases in the earth's average surface temperature ranging from 1.4 to 5.8 degrees Celsius by 2100, with serious implications for food and freshwater supplies.

In Canada, we already feel the effects of climate change:

- increasing numbers and intensity of heat waves and related health problems;
- declining water levels in the Great Lakes;
- changes in fish migration and melting of the polar ice cap;
- insect infestations in British Columbia's forests;
- hotter summers and higher levels of smog in major urban centres; and
- more extreme weather events such as droughts, ice storms and flooding.

As these climate change-related events increase, they will have a profound effect on our economy, our health and our quality of life. Action must be taken now to reduce the emissions that contribute to climate change.

The Kyoto Protocol

The Kyoto Protocol is the only internationally agreed-upon approach to reduce greenhouse gas emissions. While all countries must be part of any global solution, industrialized countries have agreed that they have both the responsibility and technological capacity to take the first steps.

For its part, Canada has pledged to reduce its greenhouse gas emissions to an average of six per cent below 1990 levels during the period between 2008-2012.

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Taking Action

Meeting this challenge requires a national effort – one that engages all Canadians and every region of the country.

That process has already begun. Canadian households protect the environment by recycling, reducing and reusing. It's time to take the next step by improving energy efficiency in our homes and making more informed choices when purchasing products and vehicles.

Canadian companies are also at the forefront, developing new fuels and technologies, and cutting their carbon emissions while improving their bottom lines.

Provincial and territorial governments are developing comprehensive strategies to help address climate change. These involve a range of measures to promote energy efficiency and investments in renewable energy sources. Canada's towns and cities encourage alternative forms of transportation, the use of renewable energy and retro-fitting of buildings.

Moving Forward

The Climate Change Plan for Canada will allow us to move forward on our climate change commitments together. The Plan proposes a national goal – for Canadians to become the most sophisticated and efficient consumers and producers of energy in the world and leaders in new, cleaner technologies.

For more information

To learn more about taking action on climate change,
or for a copy of the *Climate Change Plan for Canada*:
1 800 O-Canada (1 800 622-6232) • TTY: 1 800 465-7735
www.climatechange.gc.ca

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Canada's Climate Change Plan:

- builds on actions already taken to address climate change;
- reflects priorities identified through extensive consultations with provinces and territories, industry, environmental groups and Canadians;
- incorporates principles suggested by provincial and territorial governments on sharing benefits and burdens across the country, the importance of a made-in-Canada approach, obtaining credit for exporting clean energy and recognizing early action by industry; and

A Role for Canadians

Canada's Plan also suggests a personal goal for each Canadian to reduce emissions. On average, each Canadian generates over five tonnes of greenhouse gases a year from driving a car, heating a home and drying clothes and using other appliances.

Here are a few practical steps you can take to reduce greenhouse gas emissions:

Action

Use gasoline blended with 10% ethanol.

Consider fuel efficiency when buying a vehicle. A vehicle that is 25 per cent more fuel-efficient could save \$360 a year on a gasoline bill of \$1,440.

Have an EnerGuide for Houses evaluation done and make the recommended energy efficiency retrofits, such as sealing air leaks or changing your old furnace to a new EnergyStar model.

Install a programmable thermostat to automatically change the temperature of your house at night and when no one is home.

Dispose of your 20-year old refrigerator and replace it with a new EnergyStar model.

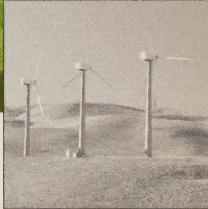
Make recycling a priority. Buy food and other products with reusable, recyclable reduced packaging.

The plan will help Canadians meet these targets through support for new technologies, energy efficiency programs and higher standards for buildings, appliances and vehicles. It will encourage Canadians to make more efficient choices at home, at work and on the road.

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- strikes the balance that will enable the Canadian economy to flourish while reducing greenhouse gas emissions.

The Plan outlines specific tools for reducing emissions, and identifies action in five broad areas:

- transportation;
- housing and commercial/institutional buildings;
- large industrial emitters;
- small and medium-sized enterprises; and
- the international market.

sions by an average of one tonne per year by 2008-2012.
ich year by driving vehicles, heating and cooling homes, washing

ns, decrease energy use and save money:

Average Yearly GHG Reduction

more	0.1 tonnes per year
energy	1.0 tonnes per year per household
n	Up to 3 tonnes per year per household
f your	0.5 tonnes per year per household
model.	0.5 tonnes per year per household
le or	Up to 0.1 tonnes

hnologies, improved transportation systems, expanded energy
s and public information programs that will help all of us make energy

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Canada



Le Plan du Canada sur les changements climatiques

- tire partie des mesures déjà prises pour lutter contre les changements climatiques;
- inspire des priorités définies à l'issue de longues consultations avec les provinces et les territoires, l'industrie, les groupes de défense de l'environnement et les Canadiens;
- tient compte des suggestions des administrations provinciales et territoriales sur la répartition des avantages et des fardeaux entre les régions, l'importance d'une approche typiquement canadienne, l'obtention de crédits au titre de l'exportation d'énergie propre et la reconnaissance des mesures rapides prises par l'industrie; et

Un rôle pour chaque Canadien

Le plan adopté par le Canada suggère également à chaque Canadien un objectif d'ici 2008 – 2012. En moyenne, chaque Canadien produit plus de cinq tonnes de gaz à effet de serre en faisant fonctionner le système de chauffage ou de climatisation de sa maison, et

Voici quelques conseils pratiques qui vous permettront de réduire les émissions d'énergie et d'économiser de l'argent :

Mesure

Utilisez un mélange d'essence contenant 10 p. 100 d'éthanol.

À l'achat d'un véhicule automobile, tenez compte de la consommation d'essence de l'automobile. En faisant l'acquisition d'un véhicule consommant 25 p. 100 moins d'essence, vous pouvez économiser jusqu'à 360 \$ d'une facture annuelle d'essence de 1 440 \$.

Demandez à un spécialiste d'évaluer l'efficacité énergétique de votre maison (Programme d'évaluation de l'efficacité énergétique pour les maisons) et procédez aux rénovations recommandées, par exemple, travaillez à l'isolation et au remplacement d'un vieil appareil de chauffage par un modèle écoénergétique (EnerGuide).

Installez un thermostat programmable qui ajustera automatiquement la température de la maison la nuit ou lorsque personne ne s'y trouve.

Débarrassez-vous du réfrigérateur que vous possédez depuis 20 ans et remplacez-le par un modèle écoénergétique (EnergyStar).

Faites du recyclage une priorité. Achetez des aliments et d'autres produits vendus dans des emballages réutilisables, recyclables ou réduits.

Le plan permettra aux Canadiens et Canadiennes d'atteindre les cibles visées dans le Plan d'adaptation au changement climatique, dont le transport modernisé, de programmes renouvelés d'amélioration du rendement énergétique des bâtiments, des appareils électroménagers et des véhicules, et de programmes de sensibilisation et d'actions éconergétiques tant à la maison qu'au travail et sur la route.

***pour l'économie dynamique
actuelles et à venir.***

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- permet d'en arriver à un équilibre grâce auquel l'économie canadienne s'épanouira tout en réduisant ses émissions de gaz à effet de serre.

Le plan donne un aperçu des outils spécifiques de réduction des émissions et définit les mesures à prendre dans cinq secteurs généraux :

- transports;
- immeubles résidentiels et commerciaux/institutionnels;
- importantes sources d'émissions industrielles;
- petites et moyennes entreprises et
- marché international.

dividuel moyen de réduction d'une tonne par année de ses émissions, az à effet de serre chaque année en conduisant son automobile et en aveuse ou sa sécheuse ainsi que d'autres appareils ménagers. s de gaz à effet de serre, de restreindre votre consommation

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	Réduction annuelle moyenne d'émissions de gaz à effet de serre
dernier. En z retrancher	0,1 tonne par an
ne ÉnerGuide calfeutrage Star).	1,0 tonne par an par ménage
votre maison	Plus de 3 tonnes par an par ménage
un appareil	0,5 tonne par an par ménage
des emballages	Jusqu'à 0,1 tonne

en recevant l'appui de nouvelles technologies, de systèmes de t énergétique, de normes plus élevées pour les immeubles, les ion de la population qui nous aideront à faire de bons choix





Connaissances scientifiques

Les scientifiques de tous les pays s'entendent sur le caractère réel des changements climatiques. Les activités humaines, en particulier celles associées à la consommation d'énergie et au déboisement, accélèrent la concentration des gaz à effet de serre dans l'atmosphère. La collectivité mondiale admet que les températures moyennes en surface pourraient augmenter de 1,4 à 5,8 degrés Celsius d'ici 2100, ce qui aurait de graves répercussions sur les approvisionnements en vivres et en eau douce.

Au Canada, nous subissons déjà les conséquences des changements climatiques :

- augmentation du nombre et de l'intensité des vagues de chaleur et des problèmes de santé connexes;
- diminution des niveaux d'eau dans les Grands Lacs;
- changements dans la migration des poissons et fonte de la calotte polaire;
- invasions d'insectes dans les forêts de la Colombie-Britannique;
- accroissement des températures estivales et des concentrations de smog dans les principaux centres urbains; et
- intensification de la violence de phénomènes météorologiques comme les sécheresses, les tempêtes de verglas et les inondations.

La recrudescence de ces phénomènes liés aux changements climatiques aura un effet dévastateur sur notre économie, notre santé et notre qualité de vie. Nous devons agir immédiatement afin de réduire les émissions qui contribuent aux changements climatiques.

Protocole de Kyoto

Le Protocole de Kyoto est le seul plan d'action international visant à réduire les émissions de gaz à effet de serre. Bien qu'elles admettent que tous les pays doivent souscrire à toute solution globale, quelle qu'elle soit, les nations industrialisées ont convenu du fait qu'elles ont à la fois la responsabilité et la capacité technologique de faire les premiers pas.

Pour sa part, le Canada s'est engagé à réduire en moyenne de six p. 100 ses émissions de gaz à effet de serre, par rapport aux niveaux de 1990 et ce, d'ici les années 2008 à 2012.

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Prendre des mesures

La réalisation de cet objectif doit être une tâche collective, mobilisant tous les Canadiens et toutes les régions du pays.

Le processus est déjà en cours. Le recyclage, la réduction et la réutilisation des déchets sont des mesures de protection de l'environnement déjà adoptées par les ménages canadiens. Le moment est venu de passer à une autre étape. Nous devons dorénavant améliorer l'efficacité énergétique de nos maisons et faire des choix plus éclairés relativement aux produits et aux véhicules que nous achetons.

Les entreprises canadiennes font également leur part, en élaborant de nouveaux carburants et de nouvelles technologies et en réduisant leurs émissions de carbone tout en améliorant leurs résultats.

Les gouvernements provinciaux et territoriaux mettent au point des stratégies exhaustives en vue de s'attaquer au problème des changements climatiques. Celles-ci comprennent une gamme de mesures de promotion de l'efficacité énergétique et d'investissements dans des sources d'énergie renouvelable. Les administrations des villes et villages canadiens favorisent l'utilisation d'autres modes de transport et de sources d'énergie renouvelable de même que la rénovation des immeubles.

Aller de l'avant

Le Plan du Canada sur les changements climatiques nous permettra de donner suite, de façon concertée, à nos engagements en matière de lutte contre les changements climatiques. L'objectif national de ce plan est de faire des Canadiens les consommateurs et les producteurs d'énergie les plus avertis du monde et des leaders dans le domaine des technologies nouvelles et moins polluantes.

Pour obtenir un complément d'information

Pour en savoir davantage sur les mesures ayant trait à la lutte contre les changements climatiques ou pour vous procurer un exemplaire du *Plan du Canada sur les changements climatiques*, composez l'un des numéros suivants :
1 800 O-Canada (1 800 622-6232) • ATS : 1 800 465-7735
www.changementsclimatiques.gc.ca

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Le Plan du Canada sur les changements climatiques

**Respecter nos
engagements ensemble**

La réalisation de cet objectif doit être une tâche collective, mobilisant tous les Canadiens et toutes les régions du pays.



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Climate Change Achieving Our Commitments Together



Climate Change Plan for Canada



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Plan du Canada sur les changements climatiques

Preface



here are few things more fundamental to Canadians than the rich natural legacy we have inherited. Canadians understand the importance of the environment, both to the quality of life we enjoy and to our future economic progress.

There is also clear recognition that certain activities are having a harmful effect on the environment and that the choices we make today can determine the health of our environment – not only for tomorrow or next year, but 100 years from now.

One of the most pressing environmental challenges is that of global warming. The international scientific community has concluded that the rapid increase in the concentration of greenhouse gas emissions in the atmosphere can be expected to increase the earth's surface temperature, change our climate, alter our environment and endanger our health.

No one country, acting alone, can solve the problem of climate change, but by working together towards a common goal, the nations of the world can successfully address this challenge.

That is why, in 1992, Canada supported the United Nations Framework Convention on Climate Change. Since then, the Government has announced its intention to ratify the Kyoto Protocol, which sets out specific targets for reducing greenhouse gas emissions.

It is vital to have a plan that will enable Canada to successfully meet its climate change objectives. The initiatives included in the Climate Change Plan for Canada will do that.

Moreover, they reflect the priorities identified through the extensive consultations that have taken place with provincial and territorial governments, municipalities, industry representatives, non-governmental organizations and individual Canadians over a number of years.

The Government of Canada is committed to continuing that collaboration in an effort to find the most effective ways to build on the proposals presented in the Plan.

Participating in the global effort to address climate change is an issue for all Canadians in every region and every walk of life. Indeed, it will require a national effort, one that summons the best from our citizens, entrepreneurs, scientists, communities and governments.

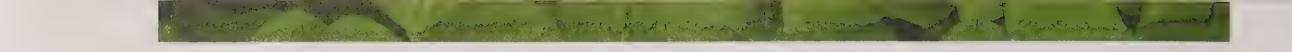
Our vision is anchored in our past successes and builds on our current strengths. It is a vision of a responsible, innovative, energy-efficient society with long experience as a leading producer of energy.

This Plan strikes the balance needed to enable our economy to flourish even as we reduce our greenhouse gas emissions. Moreover, it advances these goals without placing an unreasonable burden on any region of the country and assists Canadian industry to make the successful transition to a less carbon-intensive global economy.

Canadian companies are internationally recognized for their innovative processes. We are well-positioned to play a leadership role and benefit from the global shift to new technologies and new industries.

This Plan proposes both short-term action and a longer-term perspective. Some things can be done now, such as providing Canadians and Canadian businesses with the tools and incentives to make more energy efficient decisions; others will be done over a number of years, such as investing in more energy-efficient technologies and production methods and switching to less carbon-intensive forms of energy.

Still other initiatives, including investments in research and development in areas such as carbon management, bio-technologies, fuel cells and the hydrogen economy, will require longer periods for both implementation and results.



While we must be clear with respect to our climate change objectives, the Plan itself – by necessity – will remain a work in progress. It will evolve over time as we learn from our efforts and adapt to new possibilities and new technologies.

The Plan provides a framework and proposes a further range of initiatives for reducing greenhouse gas emissions. It will continue to evolve as Canadians and their governments work together to create the healthy environment and dynamic economy we want for ourselves and for future generations of Canadians.

With commitment and resolve, we will build that future together.

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Executive Summary

Introduction

Addressing climate change presents Canada with both an important challenge and an exciting opportunity. Meeting this challenge and seizing this opportunity will require nothing less than a national effort – one that engages every Canadian and includes every region.

That process is well begun. From Iqaluit to St. John's to Tofino, Canadian households are already involved in protecting the environment: recycling, reducing and reusing. We now need to take the next step by improving the energy efficiency of our homes and making more informed choices when deciding what products and vehicles to buy.

Canadian companies are also at the forefront, developing new fuels and new technologies and cutting their greenhouse gas emissions while improving their bottom lines.

Provincial and territorial governments are moving to develop comprehensive strategies to help address climate change. They are implementing a range of measures to promote energy efficiency while investing in sources of renewable energy. Canada's cities are encouraging alternative forms of transportation, using renewable energy and retrofitting buildings.

This Plan builds on those efforts and sets out ways that will stimulate further action. In doing so, it charts a way to meet our international obligations, enhance our competitiveness and improve the quality of life for all Canadians.

The Science

The international scientific community has concluded that there is compelling evidence that human activity, particularly activities associated with energy use and deforestation, is accelerating the concentration of greenhouse gases in our atmosphere. There is general

agreement that the global community faces the likelihood of increases in the earth's average surface temperature ranging from 1.4 to 5.8 degrees Celsius by 2100, with serious implications for global food and freshwater supplies, as well as many other implications.

In Canada we are already feeling the effects of climate change, in the form of:

- increasing number and intensity of heat waves and related health problems;
- declining water levels in the Great Lakes;
- changes in fish migration and melting of the polar ice cap;
- insect infestations in British Columbia's forests;
- hotter summers and higher levels of smog in major urban centres; and
- more extreme weather events such as droughts on the prairies, ice storms in eastern Canada, flooding in Manitoba and Quebec.

As climate change-related events such as these become more frequent, they will have an increasingly profound effect on our economy, our health and our quality of life.

Our Canadian Approach

The overall approach outlined in the Plan reflects the principles suggested by provincial and territorial governments in their October 28th, 2002 statement on climate change policy.

For example, the Plan is consistent with principles articulated in that statement such as the sharing of benefits and burdens across the country, the importance of a made-in-Canada approach, the need to continue to pursue recognition for Canada's exports of cleaner energy and the necessity of recognizing early action by industry. Specifically, the Plan recognizes the importance of:

- a made-in-Canada approach based on collaboration, partnerships and respect for jurisdiction;

- no region bearing an unreasonable burden;
- taking a step-by-step approach that is transparent and evergreen;
- minimizing mitigation costs while maximizing benefits;
- promoting innovation; and
- limiting uncertainties and risks.

Proceeding on this basis will enable Canada to make a smooth transition to a more energy-efficient and less emissions-intensive society. This is a challenge that every country in the world will have to face in the coming decades. By acting now, Canadian companies and individuals can get ahead of the curve and create a sustainable competitive advantage. The development of new products and services, in turn, will stimulate economic growth, expand exports and create jobs for Canadians.

The Plan sets out a three-step approach for achieving Canada's climate change objective of reducing annual greenhouse gas (GHG) emissions by 240 megatonnes (MT). First, there are the investments to date that will address one third of the total reduction (80 MT). Second, it articulates a strategy for a further 100 MT reduction. And finally, it outlines a number of current and potential actions that should enable Canada to address the remaining 60 MT reduction.

By necessity, the Plan will need to evolve over time. As new ideas emerge, new technologies are developed and better approaches suggested, we must be flexible enough to shift our resources from less effective actions to those with more potential to deliver emissions reductions.

Moving Ahead

The Plan proposes a national goal – for Canadians to become the most sophisticated and efficient consumers and producers of energy in the world and leaders in the development of new, cleaner technologies. To achieve our goal, the Plan proposes five key instruments:

- **Emissions reductions targets for large industrial emitters established through covenants with a regulatory or financial backstop** that would create an incentive for shifting to lower-emissions technologies and energy sources, while providing

flexibility for these emitters through emissions trading and access to domestic offsets and international permits;

- **A Partnership Fund** that will cost-share emissions reductions in collaboration with provincial and territorial governments, as well as municipalities, Aboriginal communities, non-governmental organizations, and the private sector to increase energy efficiency and reduce emissions in the most effective way;
- **Strategic infrastructure investments** in innovative climate change proposals such as urban transit projects, intermodal transportation facilities and a CO₂ pipeline;
- **A coordinated Innovation Strategy** that allows Canada to benefit fully from the innovation possibilities of our climate change agenda and builds on programs such as Technology Partnerships Canada, the Industrial Research Assistance Program (IRAP), Sustainable Development Technology Canada and the Technology Early Action Measures (TEAM); and
- **Targeted measures including information, incentives, regulations and tax measures** that will help achieve our climate change objectives in specific sectors and program areas.

Key Areas for Action in the Plan

Using these tools, the Plan identifies action in five broad areas: transportation, housing and commercial/institutional buildings, large industrial emitters, small and medium-sized enterprises, and the international market.

Transportation

The Plan takes investments already in place and sets out further measures to improve fuel efficiency, expand the use of ethanol and other low-carbon fuels and promote more energy-efficient urban and freight transportation. In particular, the Plan:

- renews our commitment to working with automotive manufacturers to **improve new vehicle fuel efficiency by 25 percent by 2010** and proposes **additional steps to encourage consumer demand for more efficient vehicles**;

- commits to new investments to **increase the use of public transit and manage growth in vehicle use**;
- sets the goal of increasing the amount of gasoline containing **10 percent ethanol blend to 35 percent of the market**, in collaboration with the provinces and territories, and the amount of **biodiesel production to 500 million litres**; and
- proposes improved performance targets and best practices for all freight transport, and enhanced intermodal infrastructure.

Housing and Commercial/ Institutional Buildings

Canadians have a tremendous opportunity to become more energy efficient and lower their home energy costs by taking a number of basic steps around their homes. The Plan will create the conditions for more informed choices and actions by:

- expanding cost-shared **home energy audits for homeowners**; and
- **providing information** to encourage consumers to purchase **energy efficient appliances and equipment**.

The Plan also proposes that governments work towards the following goals:

- energy efficient retrofits of **20 percent of the housing stock and 20 percent of the commercial/institutional building stock** by 2010; and
- building all new homes to **R2000** or equivalent standard by 2010 and all new commercial/institutional buildings to a minimum of **25 percent above the Model National Energy Code** by 2010.

Large Industrial Emitters

This Plan proposes a comprehensive approach to the large industrial emitters sectors. The three-pronged strategy, which is being developed in consultation with the provinces, territories and industry, involves:

- **emissions targets established through covenants with a regulatory or financial backstop in consultation with industry, provinces, and territories**;

- **domestic emissions trading**, with access to offsets and international permits; and
- **cost-shared strategic investments** in a number of areas such as:
 - renewable energy;
 - clean coal demonstration projects; and
 - a CO₂ pipeline.

Small and Medium-Sized Enterprises (SMEs) and Fugitive Emissions

Small and medium-sized enterprises and other low-emissions businesses can play an important role in achieving our climate change objectives through voluntary energy efficiency improvements. The Plan will:

- expand the Canadian Industry Program for Energy Conservation (CIPEC) to include SMEs;
- cost-share energy efficiency audits;
- continue to provide information and assistance, through the Industrial Research Assistance Program, on the best energy efficiency technology available to small manufacturers; and
- promote practices to reduce flaring and venting of waste gases.

International Emissions Reductions

The Plan builds on the efforts of Canadian businesses that are already active in the international emissions permit trading market. This will help developing countries chart a lower emissions path while creating profitable business opportunities for Canadian companies. To achieve this, the Government will:

- work with the private sector to establish a mechanism for efficient engagement in projects in developing countries; and
- consider the purchase of a minimum of 10 MT of international permits.

Canadians, Communities and Governments

Seizing the opportunity to reduce emissions will require the collective effort of all Canadians. The Plan:

- proposes a personal goal for each Canadian to reduce emissions by **an average of one tonne per year by 2008-2012**, supported by incentives, improved information and product availability;
- emphasizes **partnership with provinces, territories, communities, the private sector and non-governmental organizations** to further reduce emissions through a variety of means including waste diversion and land-use planning;
- commits to ongoing **collaboration with Aboriginal and northern communities** to build capacity to address their particular priorities; and
- invites governments at all levels to **lead by example**.

Cost Estimates

Economic modeling suggests that these actions should not increase fuel prices significantly and many of the actions could result in lower energy bills – for both business and consumers – through greater energy efficiency.

Overall, the economic modelling suggests that the impact of taking action on climate change is manageable. In the most likely scenario, Gross Domestic Product (GDP) is reduced by only 0.4 percent in 2010. In other words, rather than growing by 18 percent between 2002 and 2010, the economy would grow by around 17.6 percent. Employment would increase by 1.26 million jobs instead of 1.32 million. Personal disposable income would not be affected.

Meeting Canada's climate change goals calls for new directions to be set and new strengths to be developed. It requires the best of our citizens and scientists, our innovators and entrepreneurs. It is an opportunity to enhance both the competitiveness of our economy and the quality of our lives: a national project worthy of a great country.

I. Climate Change and the United Nations Kyoto Protocol

A. The Science



here is a strong consensus among scientists that climate change is already occurring and that human activity is contributing to it.

The Earth's temperature is determined in part by a naturally occurring process known as the "greenhouse effect". While certain greenhouse gases occur naturally, human activities are releasing additional greenhouse gases into the atmosphere.

Data collected from polar ice cores show that concentrations of CO₂, which had been stable at about 280 parts per million by volume for the 10,000 years between the last ice age and the start of the 19th century, have today increased by about 30 percent. If current trends in greenhouse gas emissions continue, by the end of this century their concentration in our atmosphere could be double what they had been prior to the industrial revolution.

While uncertainties exist about the timing and rate of future changes in this concentration, the UN Intergovernmental Panel on Climate Change (IPCC) – an international body made up of 2,000 of the world's top climate scientists – estimates that the average global surface temperature is likely to increase by between 1.4 and 5.8°C by 2100. While these changes may seem modest, even small changes in global average temperatures can have a dramatic impact on our climate. The last time the earth's average temperature was 5°C colder, for example, Canada was covered with three kilometres of ice.

Scientists have also concluded that changes consistent with global warming are already occurring in different parts of the world. Mountain glaciers are retreating, the global sea level is rising and climate zones are shifting. The 20th century was the warmest century of the last millennium; the 1990s were the warmest

What are greenhouse gases?

Naturally occurring greenhouse gases include water vapour, carbon dioxide, methane, nitrous oxide and ozone. Certain human activities produce more of these gases and other activities can create greenhouse gases that do not naturally occur.

Carbon dioxide (CO₂): An increasing amount of carbon dioxide is being released by the burning of fossil fuels (coal, oil, natural gas) for industrial purposes, transportation, and the heating/cooling of buildings, as well as by deforestation.

Methane (CH₄): An increasing amount of methane is being released from landfills, wastewater treatment, certain agricultural practices, as well as from grazing livestock.

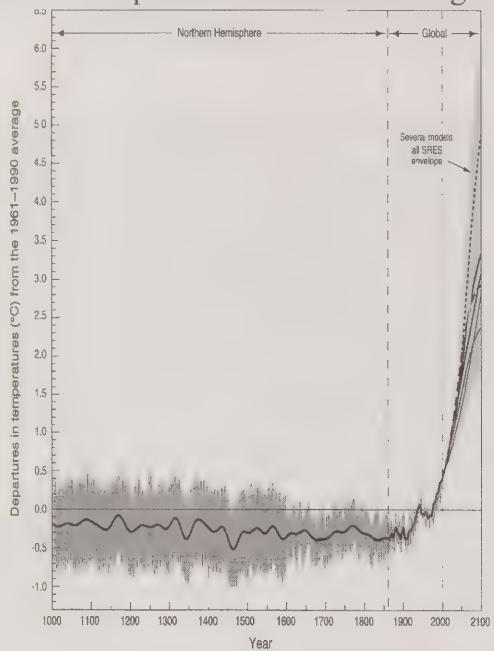
Nitrous oxide (N₂O): An increasing amount of nitrous oxide is being emitted into the atmosphere through the use of chemical fertilizers and the burning of fossil fuels.

The three greenhouse gases that are not naturally occurring, but which are included in the Kyoto Protocol, are: hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). These gases are generated in a variety of industrial processes.

decade of the last century and the years 1999 and 2001 were the warmest years yet. This is well beyond the range of natural climate variability.

Because scientists expect that northern nations will be more affected by climate change than those closer to the equator, Canada is particularly vulnerable. We are already feeling the effects: increasing heat waves and related health problems, declining water levels in the Great Lakes, changes in fish migration and melting polar ice caps, as well as insect infestations in British Columbia's forests.

Temperature variation from average



What is more, we are only beginning to get a sense of the costs related to climate change, such as hotter summers, higher levels of smog in major urban centres and more extreme weather events such as droughts on the prairies, ice storms in eastern Canada or flooding in Manitoba and Quebec. There are also the costs associated with disturbing ecosystems, from fish stocks to forestry.

All of these will have a profound effect on our economy, our health and our quality of life.

B. Why the UN Framework Convention on Climate Change?

There is strong agreement among Canadians on the need to address climate change. There has been discussion, however, of how best to achieve our climate change objectives and whether we should address the challenge of climate change independently or within an international framework.

Greenhouse gases have the same impact on the atmosphere regardless of where they are emitted. That is why a global approach is required to effectively address the climate change challenge.

In 1992, that approach was launched with more than 155 countries, including Canada, signing the United Nations Framework Convention on Climate Change (UNFCCC).

Since then, a number of United Nations conferences have been held, including one in Kyoto, Japan in 1997. The outcome of that conference was a Protocol to the UNFCCC. The Kyoto Protocol established legally binding targets for those industrialized countries that ratify the agreement and the timeframes within which those targets are to be met. Additional operational details were agreed to at subsequent meetings in Bonn, Germany and Marrakech, Morocco.

Canada has supported this United Nations process as the most effective means of ensuring global action.

The Protocol is important both for the direction it sets and the international agreement it represents. It remains the only available instrument for providing a global response and, should it fail, it would take years to negotiate a new agreement, delaying action and prolonging uncertainty.

The Protocol points us toward a future of lower greenhouse gas emissions, greater energy efficiency, sustainable growth, innovative technologies and cleaner air. At the same time, the Protocol represents only a first step – not the last word – on climate change. It will continue to evolve and, as it does so, we will take every opportunity to ensure that it is improved and strengthened.

In particular, we agree with the principle identified by the provinces and territories in the October 28, 2002 statement on climate change policy with respect to recognition for cleaner energy exports. We will continue to pursue recognition for our cleaner energy exports.

Similarly, as we move forward we will work to extend the responsibilities under the Kyoto Protocol to an increasing number of countries. As a first step, however, the industrialized countries have the resources to play a leadership role in tackling this global challenge. Just as they have led on issues such as international agreements on trade, industrialized nations must also set the pace on environmental issues.

It is anticipated that in future rounds, major developing countries will assume emissions targets, moving us closer to a truly global response.

Canada was a key supporter of, and contributor to, the Kyoto Protocol. Some of the international mechanisms and the provisions on “sinks”, for example, were to a significant degree “made by Canada”. If used effectively, they provide us with additional flexibility to meet our goals.

Under the Protocol, Canada has agreed to lower its greenhouse gas emissions to six percent below 1990 levels during the first commitment period (2008 - 2012). The Kyoto Protocol does not tell us how to meet this target: that is entirely up to Canadians.

This is an ambitious target that offers significant opportunities. The transition to an economy based on lower-emissions energy is the way of the future and Canada has the opportunity to set the pace and lead the way.

Canadians will benefit not only from new jobs and innovation, but also through the impact on their daily lives – they will be able to enjoy a healthier environment, cleaner air and lower energy costs.

We will work to meet our international commitments in a way that is most beneficial to Canadian interests. The extensive consultations we have had with provincial and territorial governments, industry, non-governmental organizations, as well as individual Canadians, provide a strong basis for the framework that is put forward in the following pages. The Plan will continue to evolve as new ideas and new approaches emerge.

C. Competitiveness Considerations

The decision by the Bush administration not to ratify the Kyoto Protocol poses an important challenge from both a climate change and competitiveness perspective. The United States is the largest total emitter of greenhouse gases and the largest emitter per capita among industrialized countries.

We should recognize, however, that the United States government is making large investments to spur innovation and encourage wider use of cleaner energy. Canada will continue to work with the United States on a range of climate change-related areas where collaboration can be of mutual benefit.

In addition, many individual states are already taking important steps to reduce greenhouse gas emissions. Oregon, Massachusetts and New Hampshire, for example, are regulating CO₂ emissions from power plants, including the use of offsets. The New England Governors, in conjunction with the Eastern Canadian Premiers, have committed to stabilizing greenhouse gases at 1990 levels by 2010 and to a 10 percent reduction by 2020. California recently passed legislation that allows the state to regulate the amount of greenhouse gases that are emitted by new automobiles and light trucks, beginning with the 2009 model year.

For Canada, the US position presents unique challenges given our close economic relationship. This Plan takes account of that relationship and of the competitiveness concerns raised by Canadian industry. We need not – and we will not – export Canadian jobs in order to meet our climate change goals.

II. Canada's Approach to Climate Change



f addressing climate change is to become a national project, it must reflect both the values and diversity of our country. While pointing us to the economic opportunities of the future, it must also address the economic realities of today. What is required is a principles-based approach that recognizes our unique circumstances and promotes our collective interests.

This approach is consistent with that put forward by the provincial and territorial governments in their statement on climate change policy issued on October 28, 2002. Those principles, including having a made-in-Canada plan focused on innovation and competitiveness, no unreasonable burden on any region of the country and recognition for early action, are reflected in the following pages and throughout the Plan.

A. Key Principles

The following key principles guide the Plan:

It must be a made-in-Canada approach that is based on collaboration, partnerships and respect for jurisdiction.

Working within an international framework, our approach addresses Canadian circumstances and takes advantage of our unique opportunities.

The Government of Canada agrees with the principle identified in the provincial and territorial statement on climate change policy that calls for Canadians to have the opportunity to provide input into the development of the Plan. That is why, following the release of the Discussion Paper on Canada's Contribution to Addressing Climate Change, a series of workshops were held in each of the 14 major cities across the country in June 2002. More recently, hundreds of Canadians have taken the opportunity to provide comments and submissions on the Overview of the Draft Plan that was released in October of this year.

The options that were presented in the Discussion Paper itself, as well as the initiatives in the Plan, have been developed after extensive consultations with provincial and territorial governments, industry, non-governmental organizations, community leaders and individual Canadians over several years. The Plan also provides for and builds on the priorities identified by those provincial and territorial governments who have developed their own climate change plans.

Greater use of renewable energy sources, improving the energy efficiency of buildings, equipment and appliances, making better use of sinks or promoting public participation through education and outreach, are areas identified by provinces and territories and that are reflected in the Plan. Some provincial plans also include proposals with respect to increasing the use of ethanol, developing CO₂ capture and storage infrastructure, proceeding with clean coal demonstration projects and enhancing public transit systems.

All of these areas are addressed by the Plan and provide a substantial foundation on which to build a concerted national effort. In determining how best to achieve our goals, we must continue this collaborative approach ensuring that provincial and territorial jurisdiction is respected in the process.

There must be a reasonable sharing of benefits and burdens requiring responsible investment by all.

The Plan reflects the commitment made by First Ministers in 1997 and the principle reiterated by the provincial and territorial statement on climate change policy issued in Halifax on October 28, 2002, that no region or jurisdiction of the country should be asked to bear an unreasonable burden in the realization of our climate change goals. The Plan draws on the lessons learned from the analysis and modeling studies (see Annex) and develops an approach that is fair and equitable while at the same time calling on every government, every region, every sector, indeed every Canadian to do their share.

All governments will need to contribute to the success of a national plan. For its part, the Government of Canada will provide additional resources for federally led initiatives and co-invest in partnership arrangements, with provinces and territories and the private sector, that help meet Canada's emissions reduction target. The Government will ensure that resources are adequate to achieve our goal and will do so in a fiscally prudent manner, aligning existing programs in support of climate change objectives and phasing in new spending over several budgets.

Our approach must be transparent and proceed step by step, keeping our Plan evergreen.

It is essential that what is being asked of Canadians be clear, consistent, reasonable and achievable. The Plan reflects a commitment to transparency, where the process is open, the timelines certain and the expectations clear. Industry must be able to plan and operate with an acceptable degree of uncertainty and risk. And Canadians should know what is expected of them – there should be no surprises.

Our approach must also be both prudent and responsible in taking the actions that are needed. That is why the Plan proposes that we proceed step by step, continuously monitoring and measuring the effectiveness of new actions against the success of those underway. This will allow us to learn as we go and adjust to changing circumstances. As we pursue our objectives for a more innovative and dynamic economy, new technologies and opportunities will emerge and additional approaches will be suggested. We must retain the flexibility required to reflect these new realities and put them to work for Canadians.

Minimize mitigation costs and maximize benefits.

The Government of Canada shares the view of the provinces and territories that we must maintain the economic competitiveness of Canadian business and industry. Our aim should always be to reduce greenhouse gas emissions in the most cost-effective way possible. Specific approaches for doing so, such as market-based instruments, will be discussed below. One of the key ways of applying this principle,

however, is by ensuring that all orders of government work together, combining the opportunities available to governments within their respective jurisdictions.

Canada will continue to enjoy strong economic and employment growth across all sectors of the economy, though there may be shifts in employment among firms as normally occurs as the economy adjusts to changing circumstances and influences. New job opportunities will appear as the markets for emerging technologies mature and as initiatives to reduce emissions are implemented (e.g., in the area of home retrofits or construction of a CO₂ pipeline). Other areas may see an evolution in the nature of the knowledge and skills required of the work force. The Government of Canada will work through a joint government-labour committee to monitor any such changes. Particular attention will be focused on labour mobility issues, particularly in rural Canada, and on skills training issues as workers move into new technology areas. The full range of worker adjustment and skills training programs would apply.

Costs can also be reduced by recognizing that our climate change goals are complementary to other key objectives that are also being pursued, such as the clean air agenda, renewing our national infrastructure and fostering a more innovative economy.

Promote innovation.

We agree with the principle identified by the provinces and territories in their climate change statement of October 28, 2002 that the Plan must support innovation and new technology. Through innovation we will be able to maintain our strong economic growth, create additional export opportunities and reduce greenhouse gas emissions. Significant progress can be made by using the best of today's technology throughout Canada, a step which would also lower the cost of those technologies through economies of scale.

We must accelerate the development and adoption of new low-emissions technologies. Many climate-friendly technologies are within reach for the first commitment period of the Kyoto Protocol. At the same time, we know that larger emissions reductions will be required over the longer term, and that this will require more than efficiency in our use of fossil fuels. It will also require improved reliance on cleaner energy.

Doing so will enable Canada to get ahead of the curve and stake out a leadership position in the emerging technologies that will transform the economies of tomorrow.

To promote innovation, we will create incentives for developing and applying new technologies, ensure a fair and competitive tax system, and foster research and development that will provide long-term solutions.

Limit uncertainties and risks.

Like the provinces and territories, the Government of Canada is committed to responsibly managing the risks related to meeting our climate change objectives.

Applying this principle means governments working with industry to limit uncertainties and address concerns about competitiveness. It means building in contingencies, assessing our progress and adjusting our approach and level of investment. It means remaining engaged in joint efforts with the United States to ensure that Canada remains competitive and takes advantage of future technological opportunities.

As we move forward, our progress should be assessed against the principles outlined above. They reflect the values we hold and they must guide the policies we pursue. Doing so will enable Canadians to make their own decisions on how best to achieve our climate change objectives.

B. Three Steps to Achieving our Target

As noted in the previous section, under the Kyoto Protocol, Canada committed to reducing its greenhouse gas emissions to 6 percent below 1990 levels on average through the first commitment period (2008-2012) - a reduction of 240 MT from our projected "business-as-usual" emissions level in 2010.

As outlined in the chart below, the Plan is a three-step approach to meeting Canada's target. Step I includes actions already underway, which are expected to reduce emissions by 80 MT. Step II involves further measures outlined in this document, which are expected to reduce emissions by a further 100 MT. Step III will address the remaining 60 MT.

Table 1: Overview of the Three Steps

	Step I: Actions Underway	Step II: New Actions	Step III: The Remainder
Actions by Canadians and Governments: Transportation and Buildings	13 MT	15-20 MT	
Large Industrial Emitters	25 MT	55 MT	
Other Industrial Emissions: Technology, Infrastructure and Efficiency Gains		16 MT	Current and potential actions that could achieve approximately 60 MT are outlined on page 14
Agriculture, Forestry and Landfills; Sinks and Offsets	38 MT	*	
International Market	2 MT	Minimum 10 MT	
Total	Approximately 80 MT	Approximately 100 MT	

* Offsets are estimated at 20 to 28 MT; because they may be sold to industry through domestic emissions trading, they are not added to the total

Step I: Actions Underway (80 MT)

Since 1998, the Government of Canada has committed \$1.6 billion in climate change initiatives, across all sectors and involving every region. Measures announced in Action Plan 2000 and Budget 2001 are expected to reduce emissions by 50 MT annually over the next five to ten years.

Many of these initiatives are being carried out in partnership with the provinces, territories and private sector and have been in operation for less than a year. An assessment of their effectiveness will be initiated in the coming months and, if required, resources will be shifted away from initiatives that are not meeting expectations into areas that have the potential to be more effective.

Canadian exports estimate that Canada's agricultural soils and forests will also absorb additional greenhouse gases from the atmosphere due to sound management practices. These ongoing actions are expected to bring credits of 30 MT annually to Canada. Under the Protocol, there is room to increase our sinks credits further through broader actions and investments.

When combined with the 50 MT annually noted above, this brings the total emissions reduction through current actions to 80 MT – one third of the way to our 240 MT target.

What is a megatonne?

This document frequently uses the megatonne (MT) as a unit of measure for greenhouse gas emissions. A megatonne is shorthand for one million tonnes. Each tonne equals one thousand kilograms. What does this mean in everyday terms? The average Canadian is responsible for about 5.4 tonnes of greenhouse gas emissions every year. All references in this document are to annual emissions of greenhouse gases.

1 megatonne = 1,000,000 tonnes

1 tonne = 1000 kilograms

What is a carbon sink?

A "sink" is any process that removes CO₂ from the atmosphere and stores it. Forests and agricultural soils can act as carbon sinks. Plants absorb CO₂ from the atmosphere through the process of photosynthesis. The CO₂ is stored in the plant tissue. Agricultural soils can act as a sink when CO₂ removed from the atmosphere by crops is stored in the roots. When the plant dies, some proportion of the plant tissue remains in the soil and is transformed into soil organic matter.

Step II: New Actions

As shown in the table on the following page, the Plan proposes three priority areas for new action, details of which are provided in subsequent sections:

- Actions by Canadians and governments in the transportation and building sectors;
- Reductions of emissions by industry through a comprehensive approach including targets established under covenants with a regulatory or financial backstop, domestic emissions trading with access to domestic offsets, the international carbon market, as well as strategic investments in renewable energy, technology and infrastructure; and
- Government purchases of permits in the international market.

Together, the actions already underway and those proposed in this step of the Plan are expected to address 180 MT of our 240 MT target, leaving 60 MT for the next phase.

Table 2: Emissions Reductions from Step I and Step II

	Canadians and Governments		Industrial Emitters			Land cover and use	International market	Totals
	Transportation	Housing and Buildings	Emissions Trading	Renewable Energy and Innovative Projects	Small and Medium - Sized Enterprises (SMEs) and Fugitive Emissions	Agriculture, Forestry and Landfill Gas		
Business-as-usual (BAU) emissions 2010	206	84		<-- 425 -->		94	NA	809
Step I Actions Underway: Action Plan 2000 Budget 2001	9	4		<-- 25 -->		8	2	Approx. 80
BAU Sinks				5		30		
Step II New Actions	12	4	55	11		Potential Offsets*	10 Minimum	Approx. 100
Total Emissions Reduction Targets for Steps I and II	21	8		96		38	12 Minimum	Approx. 180

* Estimated at 20-28 MT; because they may be sold to industry through domestic emissions trading, they are not added to the total

Step III: The Remainder

A number of current or potential reductions could help to meet the remaining 60 MT gap.

To support local priorities and promote energy efficient innovation in all sectors, the Government of Canada will establish a Partnership Fund with the provinces, territories, municipalities, Aboriginal communities, non-governmental organizations and the private sector. This Fund is described in greater detail below. The emissions reductions produced by the Fund will depend on the level of investment by all partners and the cost-effectiveness of the initiatives. It is assumed here that the Fund could result in additional reductions of between 20 and 30 MT.

In addition, there are a number of existing technological research and development investments directed at climate change issues that are just getting underway, such as Technology Partnerships Canada, Sustainable Development Technology Canada and the Technology Early Action Measures (TEAM) program. None of the emissions reductions that may result from these existing and future technology investments have been counted in the 180 MT reduction contemplated in Steps I and II of the Plan.

Technology initiatives and R&D investments could reduce emissions by an additional 10 MT or more in the first commitment period. Successful commercialization will be critical and rely upon success in pre-commercial pilots as well as in the marketplace itself.

Similarly, provincial and territorial initiatives to date have not been quantified for the purposes of this Plan. These efforts could reduce emissions by a further 10-20 MT. In addition, 100 municipalities across Canada are designing community-wide emissions reduction plans that could eliminate a further 10 MT of emissions.

The Plan estimated 24 MT in reductions through actions by individual Canadians. There are 31 million Canadians, and if each Canadian meets the goal of reducing emissions by one tonne, there would be an additional 7 MT of reductions.

Finally, the Government of Canada is in agreement with the principle put forward by the provincial and territorial governments in their October 28, 2002 statement on climate change policy that we will continue to pursue recognition for our cleaner energy exports. Such recognition could result in credits of up to 70 MT.

Table 3: Examples of Current or Potential Reductions that Could Meet the Remaining 60 MT Gap

<ul style="list-style-type: none">• Partnership Fund for working with provinces, territories, municipalities, Aboriginal communities, private sector and non-governmental organizations as well as infrastructure funding• Existing and future technology R&D investments that produce emissions reductions• Provincial and territorial actions underway not involving federal partnerships• Community-wide emissions reduction plans by 100 municipalities• A challenge to Canadians to reduce emissions by 1 tonne each (31 million Canadians; only 24 MT included in Step 2 of the Plan)• Credits for cleaner energy exports	<ul style="list-style-type: none">• 20-30MT• 10 MT• 10-20 MT• 10 MT• 7 MT• Up to 70 MT
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As can be seen from the preceding tables, the goal of reducing emissions by 240 MT is within our reach. Canada is positioned to meet its climate change target and, as we gain experience and progress is made, new opportunities for emissions reductions will become available.

C. Instruments

Based on extensive consultations on the Discussion Paper released in May, the Plan sets out a mixed approach involving five specific instruments:

- Innovation and Technology Investments
- Infrastructure Investments
- A Partnership Fund
- Covenants and Emissions Trading by Industry
- Targeted Measures

Consistent with the principle identified by the provincial and territorial governments in their statement on climate change policy, most of these instruments, including innovation, infrastructure, the Partnership Fund and targeted measures, will allow for both bilateral and multilateral approaches to our climate change priorities. The specific approach taken on different issues will be developed through discussions with provincial and territorial governments. On some issues, governments will take action independently within their own jurisdiction. On many issues, a bilateral approach may be preferred, while on other issues a multilateral approach may be the most effective way forward.

Innovation and Technology Investments

Innovation and technology will be key to the long-term solutions to climate change. Policies to address climate change, both in Canada and internationally, will spur innovation and – in the process – create new economic opportunities for first movers. We must ensure that Canadians can take full advantage of these opportunities.

The Government of Canada will increase investments in innovation and technology related to climate change, as well as reallocate funds from existing programs to climate change initiatives where appropriate.

Over the longer term, addressing climate change will transform the energy economy. To achieve our objectives, however, we will need to consider how that transition can be managed effectively.

Many of the most cost-effective investments that are currently available for reducing greenhouse gases are based on increasing energy efficiency. Further investments in technological solutions to enhance energy efficiency will yield climate change benefits and can also provide advantages to consumers and industry by lowering costs. Examples include integrated energy management systems for buildings, lightweight materials for vehicles and eco-efficient industrial processes.

In terms of energy supply, change will initially be centred on cleaner fossil fuels and the continued development and penetration of alternative non-fossil transportation fuels and emerging renewable energies. For fossil fuels, shorter-term technological advances will involve technologies such as more efficient oil and gas production and distribution. These advances will be complemented by an increase in community-based distributed power systems, as well as the increased use of co-generation and waste heat recovery.

In the medium term, the transformation will involve the development and deployment of integrated carbon management systems (often known as CO₂ capture and storage) and clean coal power production. Continued technological advances will lower costs, encourage greater uptake of wind and photovoltaic power, and enable industrial processes that are less emissions-intensive.

In the longer term, many of the challenges will be around next generation energy systems and infrastructure related to power distribution. Among these emerging technologies are intelligent emissions control systems and direct solar steam generation.

Next generation energy systems include fuel cells and the “hydrogen economy”. Fuel cells powered by hydrogen could replace the internal combustion engine and provide power sources for buildings. Canadian companies are already world leaders in fuel cell and hydrogen technologies.

Under Action Plan 2000, the Government of Canada is working with industry to resolve the challenge of refueling infrastructure for fuel cells. The Government is also prepared to explore further means by which Canada’s leadership in this area can be supported, including demonstration of fuel cells in federal buildings. Key to the hydrogen economy will be the development of clean, efficient energy sources to produce hydrogen.

Biotechnology offers another area of opportunity for climate- and environmentally friendly innovation. Bioproducts, for example, use plants to produce fuels such as ethanol that can be blended into gasoline and a wide range of products, including plastics, textiles, paints, lubricants, solvents, adhesives and even cosmetics. Enzymes and biocatalysts are also used in industrial processes to supplement or replace more energy intensive processes. Bioproducts provide alternatives to products derived from fossil fuels (e.g., gasoline and petrochemicals) and can help avoid substantial greenhouse gas and other emissions. Growth in bio-based products will also stimulate rural economic development by creating new markets for what are now waste materials. The Government of Canada is joining with provincial governments, industry and academia to develop a technology roadmap for further advancing bioproducts in Canada.

Infrastructure

Modern infrastructure is a vital part of creating and maintaining prosperity in Canada. It is also a key part of positioning Canada to take advantage of opportunities in the greener economy of tomorrow.

As announced in the recent Speech from the Throne, the Government of Canada will work with provinces and municipalities to establish a 10-year infrastructure program that will accommodate long-term strategic initiatives essential to competitiveness and sustainable growth. This will be key to the quality of life in both urban and rural areas.

Within this framework, a new strategy for a safe, efficient and environmentally responsible transportation system will be introduced. Such an initiative could help reduce congestion in cities and bottlenecks in trade corridors, while improving air quality.

New urban transit infrastructure in some of Canada’s largest cities can contribute to more efficient movement of goods and people, while reducing greenhouse gas emissions.

Similarly, intermodal freight technologies – integrating rail, water and road – could significantly reduce traffic congestion while providing co-benefits such as reducing air pollution and greenhouse gas emissions.

The Government of Canada will explore investments in projects such as a pipeline to move CO₂ from emissions sites to locations where it can be utilized or stored, in order to help achieve our climate change objectives, while at the same time encouraging greater energy production productivity and innovation.

Partnership Fund

As with any national project, the heart of the Plan is partnerships. Innovation and infrastructure are two areas where the Plan will build on the Government of Canada’s long and successful track record of working closely and collaboratively with provinces, territories, municipalities and communities, Aboriginal peoples, the private sector and non-governmental organizations. The Government of Canada will also create a new mechanism, a Partnership Fund, through which it will co-invest and collaborate on emissions reduction projects.

Governments and stakeholders across Canada face different opportunities, challenges and priorities for action on climate change. In addition, many are engaged in ongoing processes of developing their own strategies and plans. The Partnership Fund will enable the Government of Canada to be responsive to this diversity of interests and evolution of ideas.

The overall approach is to establish a fund through which the Government will cost-share the best emissions reduction proposals as they emerge over time. The Fund will be results-oriented, selecting the most cost-effective projects while also taking into

careful consideration other criteria such as the overall degree of leverage of project funding and environmental and public policy co-benefits.

The Partnership Fund will be an important vehicle by which the Government of Canada will support and collaborate with provincial and territorial governments on the implementation of their plans. It will also complement other partnerships through federally led emissions reduction measures, and new and existing funding on innovation and infrastructure.

The Partnership Fund will ramp up over the next few years. Because its results will depend so much on our partners, we have indicated a range of possible contributions to reducing Canada's greenhouse gas emissions.

Covenants and Emissions Trading

Covenants and domestic emissions trading, as a market-based instrument, holds tremendous potential to minimize the cost of meeting Canada's climate change objectives by exploiting the efficiencies of markets while encouraging innovation and strategic investments.

Companies that emit greenhouse gases would meet their commitments either by reducing their emissions directly or by purchasing domestic offsets or international permits. The requirement for emitters to hold permits for their emissions creates an incentive for the use of lower-emissions technologies and energy sources.

Such an approach is already in use both in Canada and abroad to address a range of environmental issues. Ontario, the United States, the United Kingdom and Denmark, for example, all have some form of trading system for air pollutants or greenhouse gas emissions. And the European Union is planning a union-wide greenhouse gas emissions trading system to be up and running by 2005.

As will be discussed, the Plan outlines options for a domestic emissions trading system, linked to the international carbon market that will be created under the Kyoto Protocol. The Government of Canada will continue to work with industry, provinces, territories and stakeholders to clarify the architecture of a workable, efficient and effective domestic emissions trading system.

Climate Change and Clean Air

Actions to reduce greenhouse gas emissions will also help achieve Canada's clean air goals. This includes reducing emissions of NO_x and SO₂ from emitters like thermal electricity plants, refineries and pulp and paper mills, reducing traffic congestion in cities and reducing emissions from homes and buildings. Of the fossil fuels that are burned in Canada, coal has the highest levels of air pollutants and greenhouse gas emissions.

Under the Plan, we will be investing in the commercial-scale demonstration of cutting-edge clean coal technology. This technology will substantially reduce or eliminate greenhouse gas emissions as well as air pollutants such as particulates and mercury. By 2010, new coal-fired power plants should be as clean as natural gas.

In addition, we will be working with provinces and municipalities to increase the use of urban transit, which will decrease traffic congestion in our cities and help improve urban air quality.

These are just two examples of how taking action on climate change will help improve the health of Canadians, reduce the incidence of chronic bronchitis and asthma, and reduce health care costs.

Targeted Measures

Targeted measures can include information (e.g., labeling), incentives (e.g., production subsidies and cost-shared energy efficiency audits), regulations (e.g., energy efficiency standards) and tax measures (e.g., excise tax exemption for ethanol in gasoline).

A number of tax initiatives are already in place to encourage the reduction of greenhouse gas emissions. For example, accelerated depreciation is permitted for certain renewable technologies and the ethanol in gasoline is exempt from the federal excise tax and, in some provinces, from provincial fuel taxes.

The Government of Canada will continue to monitor and consult on climate change-related tax issues with a view to providing a fair, efficient and competitive tax system. In particular, we will assess the tax treatment of permits in a domestic emissions trading system.

In addition, we will consider investments in other specific program initiatives, such as incentives for retrofitting existing homes and expanding the CIPEC program for small and medium-sized enterprises.

III. Meeting our Target and Innovating for the Longer Term



This section outlines proposed next steps in each of the following areas:

- A. Transportation
- B. Housing and Commercial/Institutional Buildings
- C. Large Industrial Emitters
- D. Renewable Energy and Cleaner Fossil Fuels
- E. Small and Medium-Sized Enterprises and Fugitive Emissions
- F. Agriculture, Forestry and Landfills
- G. International Emissions Reductions

These next steps can reduce emissions by approximately 100 MT. This is in addition to the actions already underway that are briefly summarized in each section.

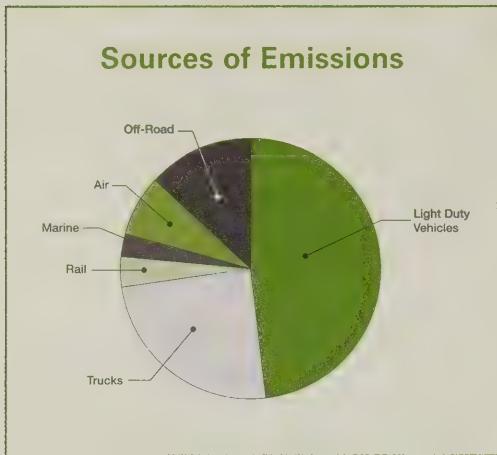
The initiatives include actions that can achieve significant emissions reductions in the shorter term, generally through increased energy efficiency (e.g., building retrofits), and actions that set the stage for innovation and further emissions reductions in the future (e.g., fuel cells and CO₂ capture and storage).

Many of the measures, and the emissions reductions associated with them, have been developed on the basis of the work of the Issue Tables that included business, academic, governmental and non-governmental representatives. The Issue Tables studied opportunities for emissions reductions and reported their conclusions two years ago.

Consistent with the step-by-step approach, additional actions for achieving the remainder of the 240 MT target beyond those discussed in this section would be considered in light of the success of these proposed next steps.

The initiatives represent a framework for action: further consultations with provinces, territories, municipalities, industry, non-governmental organizations and the Canadian public will be necessary on the details of their ongoing implementation.

A. Transportation: Summary



The transportation sector accounts for about one quarter of Canada's greenhouse gas emissions and is a major contributor to smog in our urban areas. Approximately 70 percent of GHG emissions from transportation are a result of people driving cars and goods being moved by truck and two-thirds of these emissions are generated within urban areas.

The focus for action is on vehicles and fuels that produce fewer emissions, the increased use of alternative modes of transportation for passenger travel and more efficient transport of goods. These actions will also contribute to cleaner air and reduced traffic congestion, making our cities healthier and more sustainable.

Actions Underway (9 MT)

- Negotiations for 25 percent improvement in new vehicle fuel efficiency by 2010 (5.2 MT)
- Increased ethanol production to support introduction of ethanol blending in 25 percent of gasoline supply (0.8 MT)
- Development and demonstration of refuelling technologies and infrastructure for commercialization of fuel cell vehicles (0.1 MT)
- Demonstration of integrated strategies, technologies and planning to reduce urban transportation emissions (0.8 MT)
- Negotiation of voluntary agreements with air, rail, truck and marine sectors to improve fuel efficiency of goods transport (2 MT)

Proposed Next Steps (12 MT)

- Consumer action to improve vehicle efficiency, including off-road vehicles (0.8 MT)
- Increasing the target for ethanol blending to 35 percent of gasoline supply, and setting a target of 500 million litres of biodiesel in use by 2010 (2 MT)
- Increased use of public transit, alternative approaches to passenger transportation and sustainable urban planning (7 MT)
- More efficient goods transport, including intermodal (2.3 MT)

Transportation: Background and Details on Next Steps

We live in a highly mobile society. Canadians have come to rely on their vehicles for basic transportation needs. Fast, efficient freight transportation moves goods to markets in a timely manner while providing jobs and supporting our international trade. However, all of these activities – both personal and commercial – produce significant amounts of greenhouse gases.

Section IV of this Plan will provide greater detail on how individual Canadians can help reduce greenhouse gas emissions. It is sufficient to note here that the choices Canadians make in the vehicles they drive and the frequency of their use can make a dramatic difference in the amount of greenhouse gases emitted into the atmosphere. For example, a typical late model sport utility vehicle driven 20,000 km a year produces about 6 tonnes of carbon dioxide, compared to 4 tonnes for a recent mid-sized sedan, and just 2 tonnes for a gasoline-electric hybrid vehicle.

To support Canadians in making more informed choices, this plan proposes working with other governments and the private sector to provide better information and a wider selection of products and services.

In the commercial sector, freight transportation decisions are made in a complex business environment that imposes different requirements for speed, reliability and types of service (e.g., refrigerated goods) and depends on a wide range of factors including distance, door-to-door costs and access to infrastructure.

Given that freight activity is expected to increase by 60 percent by 2020, increasing fuel efficiency within each mode and better integrating freight services to make greater use of low-emission vehicles and modes will be critical to meeting Canada's climate change objectives.

Vehicles and Fuels

Actions Underway

The Motor Vehicle Fuel Efficiency Initiative in Action Plan 2000 targets a 25 percent improvement in new vehicle fleet fuel efficiency by 2010. This improvement is possible with existing technologies and technologies that are expected to become available in this decade. To that end, the Government of Canada will negotiate targets for the introduction of more fuel-efficient vehicles into the Canadian market with automotive manufacturers. Though federal legislation to enforce fuel efficiency standards does exist, it has not been proclaimed or brought into effect, because industry has, in the past, met or exceeded required standards voluntarily.

The Future Fuel Initiative will increase ethanol fuel use in vehicles from the current level of 240 million litres per year to 1 billion litres in 2010, enough ethanol to blend into 25 percent of Canada's gasoline. This measure builds on the current federal and provincial excise tax exemptions on the ethanol portion of gasoline, as well as federal funding for research and development and the use of ethanol in the federal fleet.

What are biofuels?

Biofuels are fuels made from biological products. Two examples are ethanol and biodiesel. Ethanol is a commercial alcohol that is made today from grain. It can also be made from cellulose fibres such as straw, but this is a new approach and is still under development. Taking all factors into account during its production and use, ethanol from grain has about 40 percent fewer GHG emissions than gasoline, and cellulosic ethanol has about 80 percent fewer emissions than gasoline. Ethanol can be blended up to 10 percent with gasoline and used in cars without modification. Biodiesel is a diesel fuel substitute that can be made from a variety of vegetable oils and animal fats (e.g., recycled cooking greases). It can be blended with diesel, resulting in lower GHG emissions.

The automotive industry, fuel providers, system integrators and many others have invested hundreds of millions of dollars in furthering research and development of fuel cell vehicles and other fuel cell and hydrogen technologies. Through Action Plan 2000, we are initiating four demonstration projects that will allow both government and industry to learn more about the kind of infrastructure that would be required to fuel these vehicles and further the development of the hydrogen economy in Canada.

What are fuel cells?

Fuel cells generate electricity by a reaction that converts hydrogen and oxygen into electricity and heat. They are similar to a battery that can be recharged while power is being drawn from it. Instead of recharging using electricity, however, a fuel cell uses hydrogen and oxygen. One of its great appeals is that it generates electricity very efficiently and, depending on the source of hydrogen, with very little or no pollution

Next Steps

The Government of Canada renews its commitment to working with the automotive manufacturers to develop a new fleet efficiency goal. Our objective is to improve fleet fuel efficiency by 25 percent by 2010 and to take additional steps to encourage consumer demand for more efficient vehicles. This plan proposes a further 2.8 MT reduction in emissions from vehicles and fuels through the following initiatives.

Consumer action on vehicle efficiency, including off-road vehicles (0.8 MT)

To assist consumers in making the best environmental choices, we will enhance public information programs. A new vehicle ranking system, similar to the ENERGY STAR® system currently used on consumer appliances, will be introduced, and could provide information on the "carbon burden" or life cycle carbon emissions from different vehicles. Targeted campaigns to reduce fuel use by improving vehicle

maintenance and modifying driving practices will also be considered.

Significant reductions in emissions can also be achieved from off-road gasoline-powered products such as outboard motors and snowmobiles, as well as from diesel-fuelled commercial equipment such as farm tractors, logging equipment and construction machinery. This Plan proposes to promote more energy-efficient choices for emissions from consumer gasoline-powered products and diesel-fuelled commercial equipment through voluntary agreements with manufacturers. Other measures, such as regulatory options, could also be considered.

(of concern?)

Increase target for ethanol blending to 35 percent of gasoline supply or develop a standard for a greenhouse gas free portion of gasoline (0.9 MT)

At its recent meeting, the Council of Energy Ministers agreed that the federal/provincial/territorial Ethanol and Biofuels Working Group would conduct an analysis of issues and options related to expanding ethanol production. Manitoba and Saskatchewan have expressed interest in a national mandate.

All provinces and territorial governments agreed, in their statement of principles of October 28, 2002, that the Plan must include an incentive and allocation system that supports ethanol, among other low-carbon emissions sources of energy.

While Action Plan 2000 proposed the goal of a 10 percent ethanol blend (E-10) in 25 percent of the national gasoline supply, the Government of Canada will work with provinces, territories and stakeholders to increase this target to 35 percent E-10.

Alternatively, there could be a standard for a certain percentage of fuel to be greenhouse gas free, which would encourage the development of cellulosic ethanol. Cellulosic ethanol has an even lower greenhouse gas content than grain-based ethanol, and this technology could become commercially viable in the next few years. Grain-based ethanol will play an important role in increasing ethanol content in the near term, while cellulosic ethanol offers considerable promise for significantly reducing greenhouse gas emissions in the longer term.

Target of 500 million litres of biodiesel by 2010 (1.1 MT)

Biodiesel has potential to reduce greenhouse gas emissions, particularly in the trucking industry. Ontario has already announced its intention to exempt biodiesel from the 14.3 cents per litre provincial tax.

To further encourage the development of biodiesel, this Plan proposes that federal, provincial and territorial governments collaborate on how to reach a target of 500 million litres of biodiesel production by 2010 using a variety of tools including incentives, standards and research and development.

Passenger Transportation

Actions Underway

Action Plan 2000 established the Urban Transportation Showcase Program, through which all levels of government can work to demonstrate the potential of innovative, integrated and sustainable transportation practices in our cities. This is a nation-wide program that will bear fruit over the next five years, helping Canada manage growth in local transportation demand and establish a supportive framework for public transit investments.

Many municipalities are already taking action on measures to combat greenhouse gas emissions, congestion and health impacts related to the growth in urban traffic. There are also private-sector and non-governmental initiatives, such as commute-reduction and car-sharing programs, that can reduce greenhouse gas emissions.

Next Steps

Increased use of public transit, alternative approaches to passenger transportation and sustainable urban planning (7 MT)

In keeping with its commitment in the Speech from the Throne regarding modern infrastructure and a new strategy for a safe, efficient and environmentally responsible transportation system, the Government of Canada proposes to place a greater emphasis on public transit in existing and future infrastructure funding. This would be done in conjunction with municipal efforts to establish supportive transportation management and land-use planning frameworks, and

significant provincial and territorial actions to increase demand for public transit and reduce single-occupant vehicle use.

Potential actions include mechanisms to give traffic priority to public transit, and strategic management of the supply and pricing of parking facilities and roads. Municipalities can also improve infrastructure for non-motorized transportation, through the creation of walking and biking paths.

Under these conditions, investments in transit infrastructure and services could reduce emissions by up to 3 MT. Actions by other levels of government, such as described above, could achieve a further 2.5 MT. Increased speed limit enforcement by provinces could also reduce emissions by about 1.5 MT.

Passenger transportation is an area in which partnership between different levels of government is essential. Important opportunities to reduce emissions from passenger travel are shared among federal, provincial, territorial and municipal governments.

Goods Transportation

Actions Underway

The Action Plan 2000 Freight Efficiency and Technology Initiative was launched in November 2001, to promote greater efficiencies in the way goods are transported within Canada and to other countries. Working with the provinces, territories and industry, the Government of Canada is negotiating voluntary performance agreements, developing education and awareness programs and launching demonstration projects within all modes of transportation.

Provinces are also taking initiatives in this area, as demonstrated by Quebec's mandatory inspection and maintenance program aimed at reducing greenhouse gas emissions and smog from heavy duty vehicle use.

Next Steps

Opportunities for intermodal freight movement (1 MT)

This Plan proposes further public-private collaboration to promote the use of intermodal freight opportunities and to increase the use of low-emission vehicles and modes. This could be done through support for improvements in infrastructure, greater use of intelligent transportation, identification and removal of barriers to intermodal freight, harmonization of national and international standards and showcasing of best practices and new technologies.

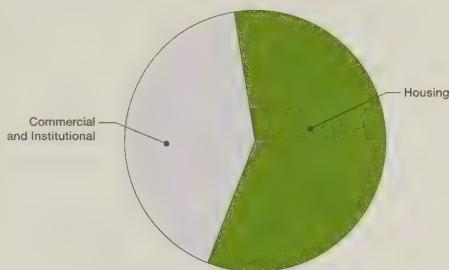
Continued efficiency improvements (1.3 MT)

Through negotiations with associations and industry, as well as new education and awareness tools, the goal outlined in Action Plan 2000 for freight efficiency improvements could be increased by 1.3 MT.

In particular, governments could work with industry and service providers to encourage the purchase and installation of equipment that could cost-effectively reduce emissions. Examples include anti-idling systems for rail and truck services, on-board tire inflation technologies and aerodynamic drag reducers. Action to reduce emissions can be stimulated through technical workshops and publications, preventive maintenance programs and fuel management practices tailored to commercial vehicles and to municipal partners with responsibility for facilitating the movement of urban goods.

B. Housing and Commercial/Institutional Buildings: Summary

Sources of Emissions



The energy Canadians consume in their homes and workplaces creates greenhouse gas emissions when it involves the combustion of fossil fuels. In addition to direct emissions of 77 MT in 2000, energy consumption in buildings accounted for 57 MT of emissions from the generation of electricity from coal, oil or natural gas.

Emissions from energy consumption in buildings can be significantly reduced through improved energy efficiency, both in the construction of new buildings and the retrofit of existing ones. In the shorter term, the greatest energy efficiency gains will come from retrofitting existing buildings, but better building standards for new construction will reduce emissions over the longer term.

Actions Underway (4 MT direct plus 2.7 MT indirect)

- Making existing buildings more energy efficient (1.2 MT)
- Energy efficiency evaluations for homeowners (0.7 MT)
- Improved standards for equipment and appliances (1.6 MT)
- Energy efficiency improvements to federal buildings (0.2 MT)

Proposed Next Steps (4 MT)

- Target R2000 energy efficiency for all new housing by 2010 (0.7 MT)
- Energy efficiency retrofit of 20 percent of housing by 2010 (1.5 MT)
- New commercial/institutional buildings to 25 percent better than the existing Model National Energy Code for Buildings by 2010 (0.4 MT)
- Energy efficiency retrofit of 20 percent of commercial and institutional buildings by 2010 (1.2 MT)

Housing and Commercial/ Institutional Buildings: Background and Details on Next Steps

Residential Housing

Well designed and operated, energy efficient houses cost less to heat and cool and provide cleaner indoor air. They also offer new opportunities for promoting Canadian technologies and the jobs associated with those technologies. High efficiency gas furnaces and energy-efficient heat recovery ventilators are just two examples of cutting-edge technologies developed by Canadians.

Actions Underway

Energy efficiency programs have already been implemented by various levels of government and by utilities. The EnerGuide for Houses initiative, which subsidizes professional home energy audits, is a good example of governments working in partnership.

The R2000 Standard for new house construction was developed in collaboration between the public and private sector in the early 1980s. It sets a standard for energy efficiency in construction that is regionally sensitive, taking into account local weather conditions. Ten thousand houses have been built to this standard and R2000 practices have contributed to a 20 percent improvement in the energy efficiency of the overall stock of new housing.

The Action Plan 2000 programs are listed in the Summary with estimates of the direct emissions reductions that will result from them. An additional 2.7 MT in indirect emissions reductions is projected to occur as a result of reduced demand for electricity.

The Yukon Housing Corporation offers reduced-rate mortgage financing for homes built or upgraded to the Corporation's energy efficiency standard. Nova Scotia has a program in place to demonstrate and promote new sustainable building practices and Manitoba has an R2000 Home Program.

Next Steps

Energy efficiency retrofit of 20 percent of housing by 2010 (1.5 MT)

This Plan proposes the goal of energy efficiency retrofits for 20 percent of housing by 2010. Cost shared audits and information for homeowners under the Energuide for Houses initiative will be expanded. Financial incentives for retrofits will also be explored.

Target R2000 energy efficiency for all new housing by 2010 (0.7 MT)

This Plan proposes that governments and the building sector work towards the goal of having all new housing built to the R2000 standard by 2010. This could be achieved through actions to promote wider penetration of energy efficient construction practices and products in the building community and their adoption on the market. The goal would be to enable provinces to incorporate the R2000 standard or equivalent level into building codes by 2010.

Commercial/Institutional Buildings

The commercial/institutional building stock is made up of health and education facilities as well as retail, office, hospitality and multi-unit residential properties. Increasing the number of energy-efficient buildings can lower energy costs for businesses, residents and governments.

Actions Underway

Natural Resources Canada's Commercial Building Incentive Program (CBIP) provides a financial incentive to owners who incorporate energy efficient measures into the design of new buildings provided the design exceeds the requirements of the Model National Energy Code for Buildings (MNECB) by at least 25 percent. Over 200 buildings have qualified for the program to date, covering more than one million square metres of floor space. The University of Ottawa Biology Building is in the CBIP, and exceeds the MNECB by 73 percent, generating annual energy savings of \$188,000.

The Energy Innovators Initiative is helping over 700 building owners invest in energy-saving retrofits by providing financial incentives, information, advice, audits and planning assistance. Currently, 18 percent of the existing commercial stock has implemented energy- and emissions-saving projects resulting in millions of dollars in energy savings.

The Better Building Partnership in Toronto is an example of innovative public-private partnership to promote retrofits in commercial and institutional buildings.

Actions by governments to reduce emissions from their own buildings are described in Section IV.

Energy efficiency retrofit of 20 percent of buildings by 2010 (1.2 MT)

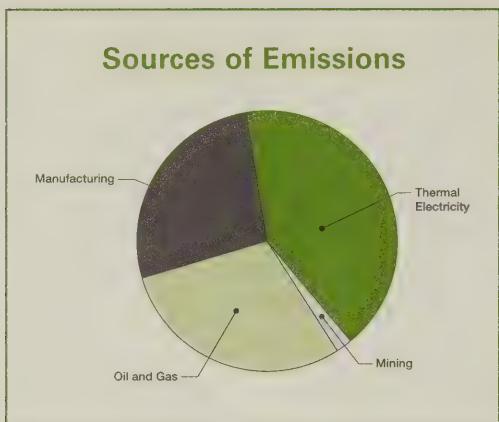
This Plan proposes the goal of retrofitting 20 percent of the commercial and institutional buildings stock to higher energy efficiency levels by 2010. This could be achieved through collaboration between provincial/territorial governments, municipalities, Aboriginal people, non-governmental organizations, trade associations and the private sector. Commercial and institutional building owners would be consulted on how to encourage retrofits. They can contribute, for example, through the formation of buyers groups to reduce price and risk in the acquisition of new technologies and products.

Next Steps

New buildings to be 25 percent better than the existing Model National Energy Code for Buildings by 2010 (0.4 MT)

This Plan proposes that all new commercial and institutional buildings be 25 percent better than the MNECB by 2010. Governments and the private sector would work together, through programs like the CBIP, towards this goal.

C. Large Industrial Emitters: Summary



The Large Industrial Emitters include firms in both upstream and downstream oil and gas sectors, electricity generation, and mining and manufacturing, such as cement plants and iron and steel mills. They are expected to produce about half of Canada's total greenhouse gas emissions by 2010.

These enterprises supply energy and other essential products to Canadians and make a substantial contribution to our economy, including through exports. As part of the process of producing energy and other products, greenhouse gas emissions are created. Enterprises in these sectors have been active proponents of improved environmental

performance, and have made considerable strides in improving the emissions intensity of their production. The Voluntary Challenge and Registry, Quebec's ÉcoGESte and the Canadian Industry Program for Energy Conservation (CIPEC) have been important mechanisms for supporting and stimulating these efforts. At the same time, output in some of these sectors has been growing rapidly, leading to growth in emissions.

Actions Underway (25 MT):

- Action Plan 2000 programs to support emissions reductions in the industrial sectors

Proposed Next Steps:

- Targets for emissions reductions established through covenants with a regulatory or financial backstop (55 MT)
- Emissions trading and access to and facilitation of domestic offsets and international credits
- Complementary actions promoting innovation and technology (11 MT - see Section III.D)

Large Industrial Emitters: Background and Details on Next Steps

The large industrial emitters are in three main sectors: thermal electricity, oil and gas, and mining and manufacturing.

In the electricity sector, greenhouse gas emissions can be reduced through greater reliance on cleaner sources of energy for generating electricity, more efficient generation of that electricity and more efficient use of electricity by consumers.

Low-emissions sources of electricity already play a significant role in Canada's energy mix. These include hydro-electricity and nuclear power. There are also emerging renewable sources, such as wind, that currently account for only a small percentage of our supply of electricity, but which could play a much larger role over time.

In addition, there are emerging technologies for reducing the emissions from electricity generated from coal. Such technologies are of particular interest to Canada, given our abundant resources of coal.

In the oil and gas sector, there is potential for reducing emissions by lowering the emissions intensity of oil and gas production and distribution. For example, reducing the leakage of methane from natural gas pipelines and reducing the use of energy in oil sands production could cut emissions and costs, depending on the size of the investment required and the payback period. This industry is well underway in achieving these kinds of emissions intensity reductions. Over the past decade, for example, the oil sands sector was a key driver of economic growth, investing \$21 billion and creating 100,000 jobs, while at the same time reducing its emissions intensity by 26 percent.

The mining and manufacturing sector is highly diverse, but emissions generally fall into two categories: those arising from the combustion of fossil fuels for energy or heating, and those from industrial processes in which greenhouse gases are emitted as a direct by-product of those processes. There have been some notable areas of success in reducing emissions in this sector, largely due to emissions mitigation technologies and increased energy efficiency. A continuation of these trends would further reduce emissions.

Actions Underway

Canada's Climate Change Voluntary Challenge and Registry Program (VCR Inc.) was established in 1997 to encourage voluntary action by large companies to reduce their greenhouse gas emissions by documenting Action Plans, best practices and achievements. There are 907 organizations currently registered with VCR Inc., covering virtually all large industrial emitters. More than 80 of the organizations registered are from the oil and gas sector. Many of these are Champion Level Reporters. Quebec has a similar voluntary program called ÉcoGESte.

The Canadian Industry Program for Energy Conservation (CIPEC) is another industry-government partnership that promotes action to reduce emissions. Established 27 years ago, CIPEC provides a forum for industry to set voluntary targets, exchange information and work with government to develop the tools and services needed to improve energy efficiency. Companies under the CIPEC umbrella averaged an energy intensity improvement of two percent per year between 1990 and 1999.

In Action Plan 2000 and Budget 2001, the Government of Canada committed an additional \$370 million over five years to support the reduction of greenhouse gas emissions in the industrial sectors. The largest amount was support for wind energy production, with further funds for audit programs, bench-marking initiatives and CO₂ capture and storage projects.

Next Steps

This Plan proposes a comprehensive approach for the large industrial emitters, in keeping with their key role in Canada's economy and their substantial share of emissions. Although no final targets have yet been determined, there are ongoing discussions with industry representatives on the role these sectors will play in contributing to Canada's Kyoto objectives. As the following chart indicates, the large industrial emitters are forecast to contribute almost 50 percent of Canadian emissions by 2010.

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The Plan proposes a three-pronged approach to the large industrial emitters:

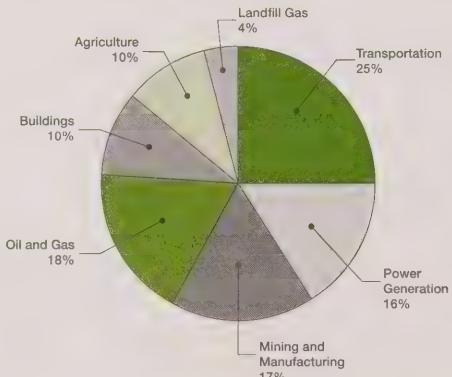
- targets for emissions reductions established through covenants with a regulatory or financial backstop (55 MT);
- access to emissions trading, domestic offsets, and international permits to provide flexibility; and
- complementary measures, including cost-shared investments in innovative technologies to reduce emissions (11 MT – see next section on Renewable Energy and Cleaner Fossil Fuels)

In all its work with the large emitters, the Government will seek to design measures that are effective in encouraging lower emissions, that are administratively efficient and clear, and that maintain the competitiveness of Canadian industry.

Covenants and Emissions Trading

Industry has expressed interest in covenants as an approach that may lend itself more readily to dealing with individual sector circumstances than a purely regulatory approach. The United Kingdom has used covenants for implementing emissions reductions and emissions trading. Companies or sectors that enter into these agreements and comply with them are then exempted from the climate change levy. *Would we do this?*

Emission by Sector in 2010



Sectors proposed for inclusion on the basis of emissions intensity

- thermal electricity generation (coal, oil and gas)
- oil and gas (upstream extraction, oil and gas pipelines, gas utilities, petroleum refining)
- mining (both metal and non-metal)
- pulp and paper production
- chemical production (industrial inorganic chemicals, industrial organic chemicals and chemical fertilizers and fertilizer materials)
- iron and steel production
- smelting and refining
- cement and lime production
- glass and glass container production

What is an offset?

When emissions reductions in sectors not covered by an emissions trading system are sold into that system, these reductions are called "offsets" because they offset emissions generated by industries in the emissions trading system. This Plan proposes that the forestry, agriculture and possibly landfill sectors be permitted to sell offsets into the emissions trading system. For example, the mass planting of trees, which acts as a carbon sink, could generate an offset that could be traded to another company looking to reduce its emissions. Since these emissions reductions would offset emissions reductions that would otherwise be required of large industrial emitters, they would not lead to more emissions reductions in Canada overall. The advantage of offsets is that they could provide alternatives for reducing emissions to the large industrial emitters, and a market mechanism for stimulating emissions reductions in other sectors.

Alberta suggests in its plan that sector agreements would be backstopped by regulation or financial consequences for non-participation. Whatever the approach finally determined, the Government of Canada will work with industry to ensure that covenants with a regulatory or financial backstop are a central element of the Canadian strategy to reduce industrial emissions.

Covenants will take account of the competitiveness issues in each sector and could address a number of elements, such as emissions intensity undertakings, technological investments and any other initiatives to reduce emissions, as well as partnership activities.

As noted in Section II, emissions trading is a market mechanism that could provide flexibility for industry in meeting its target. The options under discussion with industry would require companies to have permits to cover their emissions. A large proportion of the expected permit requirements would be provided free to companies, based on their level of production and an

emissions intensity factor. Companies would then have a choice with respect to their remaining permit requirements. They could invest in emissions reductions or purchase permits or offsets, or a combination of both.

Under an emissions intensity approach, permits received by a firm would grow or shrink based on production. Firms with lower emissions intensity in a given sector would need to purchase fewer permits or may even have surplus permits. While the system would provide incentives to reduce emissions, it would not place an absolute cap on industry's or any firm's emissions. There are various options for establishing the emissions intensity factor for a sector, including actual performance in a defined period or a technical and economic assessment of emissions reductions possibilities for the sector. The Government will continue discussions with industry and provincial and territorial governments to ensure the approach taken on emissions intensity is reasonable and the targets achievable.

Table 4: Illustrative Costs for Selected Industries with 85 Percent Free Permit Allocation (at \$10/Tonne Carbon Price)

Sector	\$ per Unit	Cost as % of Price	Sector	\$ per Unit	Cost as % of Price
Conventional Oil (\$/barrel)	0.03	0.09	Electricity-Coal (¢/KWhr)	0.14	1.94
Heavy Crude Oil (\$/barrel)	0.015	0.05	Electricity-Oil (¢/KWhr)	0.12	1.57
Oil Sands-Bitumen (\$/barrel)	0.10	0.34	Electricity-Gas (¢/KWhr)	0.04	0.60
Oil Sands-Synthetic (\$/barrel)	0.12	0.31	Cement (\$/tonne)	1.18	1.18
Natural Gas (\$/mcf)	0.005	0.14	Lime (\$/tonne)	1.85	2.50
Pipelines (\$/mcf)	0.0014	Not avail.	Pulp and Paper (\$/tonne)	0.59	0.06
Refined Petrol Products (\$/m ³)	0.17	0.03	Aluminum (\$/tonne)	4.73	0.23
Steel-Conventional (\$/tonne)	2.10	0.29	Industry Chemicals (\$/tonne)	0.31	Not avail.
Steel-Electric Arc (\$/tonne)	0.60	0.08	Agriculture Chemicals, Fertilizers, etc. (\$/tonne)	2.63	1.46

To give a sense of the possible order of magnitude of impacts on industry, the following table presents illustrative direct costs for selected industries, based on an option of 85 percent free permit allocation and hypothetical emissions intensities for sectors in 2010. It assumes that all the necessary emissions reductions are purchased or achieved at \$10 per tonne. For a few industries, such as coal-fired power generation, cement and the lime industry, cost is more significant, potentially raising competitiveness issues. For most industries, however, the impact is less than one percent of unit price. The table is for illustrative purposes only and costs for sectors could differ significantly using alternative methodologies.

Addressing Industry's Concerns

Industry has a particular concern about the extent of risk that an emissions permit regime might expose it to. On quantity, it has asked whether it might face further targets as part of the remaining 60 MT towards the estimated gap of 240 MT. The Government recognizes the need for clarity and agrees that the target under emissions trading will not be more than 55 MT. Any amounts beyond that target would be achieved through incentives.

The Government also recognizes concerns that there may be exceptional circumstances where the ten-year time frame from now to 2012, which is the end of the first commitment period under the Kyoto Protocol, is too short to allow for needed technology development and strategic capital turnover. The Government is prepared to discuss an approach whereby a pre-approved commitment of larger emissions reductions over the somewhat longer term could be accepted in lieu of reductions in the nearer term. Any approach of this nature would need to bear in mind the restoration rate for Governments under the Kyoto Protocol.

On price, industry has asked whether it might be provided protection in the event that the international carbon price is very high. While industry should assume its normal responsibility for managing risks associated with price fluctuations, the Government will work with industry on options for providing protection against risks associated with sustained carbon prices above certain levels.

Finally, there have been questions around recognition for early action in emissions reductions by companies or sectors. A joint industry-government group did extensive work on this issue in 1999 and concluded not to recommend that a formal system of credits be put in place, partly because of the complexities of the issue. In 2000, federal and provincial energy and environment ministers endorsed the principle that companies that take early action should not be disadvantaged by an output based emissions regime. The Government will continue to work with industry to design a system that will not disadvantage those firms that have taken early action.

Consultations

Discussions will continue with industry, provincial and territorial governments and other stakeholders with the intention of arriving at a general approach to industrial emissions reductions in the early months of 2003. It is expected that the details of the system will then be developed in the 2003-2004 period and implemented as soon as possible thereafter.

D. Renewable Energy and Cleaner Fossil Fuels: Summary

Increased use of renewable energy and demonstration of innovative new technologies for cleaner fossil fuels can contribute both to meeting Canada's Kyoto target and to getting Canada's industrial sector on a longer-term lower emissions intensity path. Innovation in these areas can also create significant economic opportunities for Canadian companies. Partnerships between governments and the private sector are an important tool for success.

Actions Underway (12 MT)

- An incentive for wind power production (2.8 MT)
- Green power purchases for 20 percent of the Government of Canada's electricity needs (0.2 MT)
- Cooperation with provinces to reduce barriers to interprovincial electricity trade and transmission (5.4 MT)
- A CO₂ capture and storage initiative (3.5 MT)

Proposed Next Steps (10.6 MT)

- Target 10 percent of new electricity generating capacity from emerging renewable sources (3.9 MT)
- Identify and develop options to address impediments to new regional hydroelectricity transmission and generation capacity
- Demonstrate clean coal technology (4.5 MT)
- Establish a CO₂ capture and storage pipeline (2.2 MT)

Renewable Energy and Cleaner Fossil Fuels: Background and Details on Next Steps

Renewable Energy

An increase in the production and use of renewable energy will be key to meeting our climate change objectives. Renewable energy includes hydroelectricity, which is already widely in use in Canada, as well as emerging sources of renewable energy such as wind, solar and biomass.

Actions Underway

A number of provinces have already demonstrated leadership by undertaking initiatives or setting targets that will increase the overall share of electricity generated from emerging renewable energy sources. For example, BC Hydro will meet at least 10 percent of its new electricity requirements from emerging renewable sources by 2010; the Quebec government will double its target to purchase 100 megawatts of wind-generated electricity; and Saskatchewan and Prince Edward Island have committed to purchasing wind-generated electricity for government facilities.

The Government of Canada provided \$260 million for the Wind Power Production Incentive in Budget 2001. This will directly support the creation of 1,000 megawatts of wind energy capacity during the next five years. In addition, the Market Incentive Program in Action Plan 2000 provides financial incentives to electricity distributors to offer "green" power to their residential and small-business customers.

Action Plan 2000 set out the goal of reducing undue impediments to the development of Canada's hydroelectric potential and of transmission capacity to deliver this energy to Canadian markets, while maintaining federal and provincial environmental standards. The Government of Canada cooperated with provinces and industry on a study of the potential to develop Canada's hydroelectric resources and transmission capacity. This work was carried out under the auspices of the Council of Energy Ministers and was considered by Ministers in September 2002. Discussions have also been initiated with interested

federal departments and agencies on the potential to continue to improve federal regulatory processes affecting hydroelectric and transmission development in Canada. It has been estimated that the accelerated availability of additional transmission capacity and hydroelectricity to Canadian markets could reduce emissions by approximately 5.4 MT by 2010, with greater potential in the longer term.

Next Steps

Provinces and territories noted in their statement of principles of October 28, 2002, the importance of creating incentives for lower- or no-emissions sources of energy. The proposed emissions trading system for large industrial emitters will do this, given that no-emissions sources will not have permit requirements. The following steps are additional ways in which lower- or no-emissions sources can be promoted.

Target 10 percent of new electricity generating capacity from emerging renewable sources (3.9 MT)

The Plan sets the target of at least 10 percent of new electricity generating capacity in Canada to come from emerging renewable sources. This could be achieved in a number of ways, including expanded production incentives, renewable energy portfolio standards in provinces, increased efforts to develop market demand, as well as the stimulus provided by the proposed emissions trading system. A federal-provincial working group is examining how renewable portfolio standards could work in the Canadian context.

Consumers can play a role by asking their utilities to supply them with emerging renewable energy. Utilities in five provinces currently offer emerging renewable power options and three more are considering doing so. The higher price charged helps support the development of additional emerging renewable power.

The Government will cooperate with the Canadian Electricity Association on the development of an electricity labeling scheme indicating the relative environmental impact of different electricity generating sources. The federal "green power" guideline will include a review process for low-impact, large-scale hydro projects to qualify for the logo.

Identify and develop options to address undue impediments to new regional electricity transmission

The Council of Energy Ministers instructed officials across governments and departments to develop terms of reference for an expanded analysis to identify institutional, regulatory and economic constraints to new regional transmission development in Canada, and to set out options to address these constraints. This work is to take into account the evolving competitive and integrated nature of North American electricity markets.

Cleaner Fossil Fuels

CO₂ Capture and Storage in the Oil and Gas Sector

CO₂ capture and storage is a technique that is capable of playing a major role in reducing Canada's greenhouse gas emissions while enabling Canada to make use of its abundant fossil fuel resources.

It involves the "capture" of CO₂ from sources such as fossil-based electricity generation, oil sands production and industrial processes such as fertilizer plants, before the CO₂ is emitted to the atmosphere. The CO₂ can then be injected deep underground, either in oil and gas reservoirs, coal beds or deep aquifers.

Companies are already injecting CO₂ into oil reservoirs as a means of forcing out oil that would otherwise be unrecoverable. This technique is referred to as Enhanced Oil Recovery (EOR). CO₂ can also be injected into coal beds that are too deep underground to be mined. The CO₂ forces methane out of the coal bed, and that methane can be used as an energy source (natural gas) or used to produce hydrogen for fuel cells that can power vehicles and buildings.

Actions Underway

Both the Government of Canada and the Governments of Alberta and Saskatchewan are actively working to encourage CO₂ capture and storage projects.

A CO₂ capture and storage initiative was developed under Action Plan 2000 to advance the understanding of the technique. The Government of Canada is working with provinces and industry to design and

implement the financial incentive program to sequester the CO₂ into long-term storage through specific enhanced oil recovery projects. The initiative also includes the International Energy Agency's Weyburn CO₂ Monitoring Project in Saskatchewan, a \$42 million, four-year international effort to enhance the understanding of geological storage of CO₂ associated with enhanced oil recovery.

Current efforts are aimed at establishing CO₂ capture and storage projects involving EOR within the next two to three years.

Over the long term, 50 MT per year could potentially be captured and stored. Realizing this potential would require further developments in the technology for capturing the CO₂ (which is the most technologically demanding part of the approach) as well as the technology for injecting CO₂ in coal beds and deep aquifers, and a reduction in the associated costs.

A crucial element for putting CO₂ capture and storage to work is the means to transport CO₂ from where it is captured to where it can be injected underground, in quantities sufficient to achieve economies of scale unavailable to individual projects.

Next Steps

Establish a CO₂ capture and storage pipeline (2.2 MT)

The Government of Canada is prepared to work with provinces and the private sector to explore the transportation needs associated with CO₂ capture and storage as proposed in the Alberta plan, including consideration of a suitable proposal for the construction of the backbone of a capture and storage pipeline system. This, in turn, could further accelerate the development of an effective CO₂ capture and storage market.

Clean Coal Technology

CO₂ emissions from coal-fired electricity generation account for nearly 100 MT of Canada's annual greenhouse gas emissions, principally from Alberta, Saskatchewan, Ontario and Nova Scotia. A number of technologies are under development that offer the opportunity to capture the CO₂ from coal-fired plants, making the CO₂ available for storage or use.

In a conventional coal-fired electricity generation station, the emissions contain about 15 percent CO₂. A number of approaches are being developed that could remove the CO₂, as well as other pollutants. The captured CO₂ could then be compressed, transported and injected into a geological reservoir.

Actions Underway

Work on developing technologies to effectively capture CO₂ is underway in a number of countries, with some of the leading work being done in Canada. There are a number of technologies at, or near, the demonstration stage that can capture the CO₂ and other pollutants emitted by coal-fired electricity generating stations.

To explore this opportunity, the Canadian Clean Power Coalition (CCPC) has been formed by Canada's coal-burning electrical utilities and coal producers. With funding from the Government of Canada, the Governments of Alberta and Saskatchewan and a number of others, this consortium is assessing the technology options for commercial demonstrations on a retrofit of an existing plant and on the construction of a new generating station.

Next Steps

Demonstrate clean coal technology (4.5 MT)

The Government of Canada is prepared to consider participation in suitable clean coal demonstration projects, whether through the retrofit of an existing plant and/or the construction of a new generating station. A Canadian retrofit project would likely be the first of its kind in the world.

A new plant demonstration could draw on the experience from demonstration plants already built or anticipated in other countries, although a Canadian demonstration would need to address the special characteristics of Canadian coals (moisture and ash content). Both projects would be of tremendous interest internationally. Technical and financial involvement would be solicited from other countries.

E. Small and Medium-Sized Enterprises and Fugitive Emissions: Summary

Emissions from small and medium-sized enterprises (SMEs) and fugitive emissions in the oil and gas sector would not be covered by the proposed emissions trading system.

Energy efficiency improvements in SMEs help reduce emissions and lower energy costs for these businesses.

Fugitive emissions are not proposed for inclusion in emissions trading because of difficulties with precise measurement. However, there is considerable scope for reducing these emissions through best technologies and practices.

Actions Underway (2 MT)

- Improvements in industrial energy efficiency in sectors not covered by the proposed emissions trading system (2 MT)

Proposed Next Steps (5 MT)

- Extend voluntary targets to SMEs (0.7 MT)
- Continue to work through the Industrial Research Assistance Program (IRAP) to help SMEs reduce emissions
- Further work to reduce fugitive emissions (4 MT)

Small and Medium-Sized Enterprises and Fugitive Emissions: Background and Details on Next Steps

Small and Medium-Sized Enterprises

There are more than 34,000 establishments engaged in general manufacturing (e.g. textiles, wood products, food and beverage, electronics) that would not be covered by the emissions trading system. While this is a diverse group of mostly small and medium-sized enterprises (SMEs), their common characteristic is that they are neither energy nor emissions-intensive.

Together, they account for only about 5 percent of industrial emissions. Inclusion in an emissions trading system is not the most effective way to reduce emissions in this sector, given the diverse nature and small size of firms.

For these companies, emissions can be reduced through thousands of discrete investments in new capital, such as boilers and furnaces, switching fuel, and programs of continuous improvement in their operations.

These actions can also result in lower energy costs and improved competitiveness. In addition, they can create a larger market for environmentally friendly goods and services such as advanced heating and cooling systems, micro-cogeneration and energy management control technologies.

Actions Underway

Action Plan 2000 provided funds to start addressing emissions from some of the less energy-intensive companies through audits and information.

Next Steps

Extend voluntary targets to SMEs (0.7 MT)

This Plan proposes to expand the Canadian Industry Program for Energy Conservation (CIPEC) to include voluntary energy efficiency targets for SMEs. Doing so could help reduce greenhouse gas emissions by 0.7 MT by 2010.

CIPEC will help companies implement emissions-reducing investments through cost-shared audits, full process feasibility studies, sectoral bench-marking studies and best practices. Emphasis will be placed on getting the right information directly into the hands of company decision makers.

Continue to provide support to SMEs through IRAP for reducing emissions

The Industrial Research Assistance Program (IRAP) of the National Research Council of Canada will continue to work with Canadian SMEs to reduce emissions, through technical and financial assistance provided through the IRAP network of 260 advisers located in 90 communities across Canada.

Fugitive Emissions

Fugitive emissions come mainly from the releasing or burning (flaring) of waste gases during oil and gas production and exploration, as well as from small leaks in natural gas equipment, lines and storage tanks. They account for seven percent of Canada's total greenhouse gas emissions.

While some releasing or burning is necessary to depressurize equipment, there are opportunities to reduce such emissions by reducing leaks and losses, recovering waste gas streams, finding new uses for recovered gas and improving combustion efficiency.

Actions Underway

A number of initiatives are already underway to address fugitive emissions. The Alberta Energy Utilities Board, for example, has set aggressive guidelines to reduce all types of burning. Under the Clean Air Strategic Alliance (CASA), the Government of Alberta is working with industry and environmental groups to set voluntary targets to reduce fugitive emissions.

Next Steps

Further action to reduce fugitive emissions (4 MT)

This Plan proposes that consultations be held with industry, the provinces and territories on a target of 4 MT in reductions in fugitive emissions associated with the release or flaring of waste gases as well as from leaks in equipment, lines and storage tanks.

Building on the Alberta approach, this could be achieved through information, demonstrations, regulations and guidelines. Research done in conjunction with industry suggests some 4 MT in reductions would be achievable through leak detection and repair programs, technology demonstration and other support.

F. Agriculture, Forestry and Landfills: Summary

Forests and agricultural soils both absorb and release carbon dioxide through natural processes of photosynthesis and decomposition. When, on balance, they absorb more carbon dioxide than they release, they are net carbon sinks. Forests and agricultural soils in Canada are projected to provide a carbon sink of 30 MT by continuing current management practices, and this sink could be further increased through additional action. Agriculture generates about 60 MT of greenhouse gas emissions (methane and nitrous oxide), while landfills emit about 24 MT (primarily methane).

Agriculture, forestry and landfills are all areas where new activities to reduce emissions and increase sinks represent potential offset credits in a domestic emissions trading system.

Actions Underway (8 MT)

- Promotion of sinks through Action Plan 2000 and the Greencover Canada component in the Agriculture Policy Framework (5.8 MT)
- Green Municipal Funds for landfill methane capture (2.2 MT)

Proposed Next Steps

- Establish a framework to enable new agriculture and forestry sinks (beyond the 30 MT in sinks from existing practices) to be sold as offsets in an emissions trading system
- Consult on whether to regulate emissions reductions from new capture and flaring of landfill gas or allow them to be sold as offsets

Agriculture, Forestry and Landfills: Background and Details on Next Steps

Agriculture and Forestry

Canada's 247,000 farmers manage 68 million hectares of land and millions of livestock. They are among the most productive and innovative farmers anywhere in the world and Canadian farm organizations are leaders in promoting new environmental management techniques with their members. Farmers and governments have worked together to improve farming methods and reduce soil erosion, thereby increasing retention of carbon dioxide in soils. Since 1991, for example, use of low tillage has increased by 350 percent, summer fallow has decreased by 40 percent and hay in crop rotations has risen by 27 percent. Assuming that current practices continue,

agriculture is predicted to generate a carbon sink of 10 MT in the first commitment period. There is no upper limit on Canada's agricultural sinks under the Kyoto Protocol.

With respect to forestry, current projections are that existing forest practices will result in a carbon sink of 20 MT. Investments in plantations, policy changes to reduce deforestation and changes in forest management practices, including intensive silviculture and improvements to forest conservation, could significantly add to this sink. Canada's limit for forest management sinks under the Kyoto Protocol is 44 MT.

Actions Underway

Under Action Plan 2000, the federal government is assisting farmers to take action on climate change through a number of initiatives: a shelterbelt program to encourage more planting of trees around farms to absorb carbon dioxide and reduce wind erosion of soil;

a Greenhouse Gas Mitigation Program to work with farm organizations to promote climate-friendly practices that improve nutrients, soil and livestock management; and science and technology investments to develop lower emissions technologies.

The Agriculture Policy Framework will promote farm environmental planning to improve management of greenhouse gases. Within this Framework, Greencover Canada is a national initiative to promote sustainable land use and expand the area covered by perennial forage and trees. This initiative will improve management of agricultural land by encouraging conversion of marginal annual crop land to perennial vegetation; improve management of existing forage and range land; protect water quality by enhancing riparian and/or critical wildlife habitat; and enhance integration of shelterbelts into the agricultural landscape.

BIOCAP Canada is bringing together researchers to further scientific understanding of the processes and potential for enhancing forest and agricultural sinks and reducing emissions. The Government of Canada has provided \$6 million to support BIOCAP's work.

The combined effect of the various climate change and environmental initiatives for agriculture is estimated to result in another 5.8 MT of emissions reductions and sinks credits during the first commitment period of the Kyoto Protocol.

With respect to forestry, Action Plan 2000 is supporting the Feasibility Assessment of Afforestation for Carbon Sequestration (FAACS) to analyse the potential for large-scale creation of new forests.

The Government of Canada is working with provincial and territorial governments, farmers and foresters to develop the measurement tools and inventories needed to qualify under the Kyoto Protocol for credits for carbon sequestration and emissions reductions.

Next Steps

Establish a framework for offsets

The Plan proposes to establish a framework that will enable agricultural and forestry sinks and emissions reductions to be sold as offsets into a domestic emissions trading system (see Section III.C). Offsets would have to be measurable and go beyond business-

as-usual practices. Governments, farmers, foresters and large industrial emitters will need to work together to design the offsets system.

The October 28, 2002 provincial and territorial statement on climate change policy stated that benefits from assets such as forest and agricultural sinks must accrue to the province and territory that owns the assets. The Government of Canada proposes that sinks credits that accrue from business-as-usual actions will be used to reduce Canada's overall emissions reduction target, in keeping with the principles of minimizing costs to the economy, thereby benefitting all sectors, including forestry and agriculture, and no undue burden in any region of the country. Investments that enhance the business-as-usual sink beyond the estimated 30 MT would produce credits for sale to the benefit of investors and owners through the proposed offset system. This ensures that new and additional sinks credits will have monetary value in addition to the economic reasons that already prevail for pursuing good forestry and agricultural management practices. The Government of Canada will work with all provinces and territories to establish an accurate sinks inventory.

Fast growing, high yield forest plantations could increase the rate of carbon storage in the first commitment period, with even greater results as trees mature in subsequent periods. The Canadian Council of Forest Ministers agreed in September 2002 that this should be the subject of further discussion among federal, provincial and territorial governments. The resulting sustained economic activity would provide increased employment and income diversification for rural and Aboriginal communities across Canada.

Landfills

Canadian landfills generate about 24 MT of greenhouse gas emissions annually, primarily from methane. Currently, an estimated 25 percent of landfill methane is recovered through active collection systems.

Going beyond merely capturing the landfill methane and utilizing it to displace other forms of fuel and/or energy use could further reduce greenhouse gas emissions and

result in revenues for developers, industry and municipalities, and in environmental and health benefits.

Actions Underway

The Federation of Canadian Municipalities' Green Municipal Enabling Fund and Green Municipal Investment Fund are pursuing projects to reduce greenhouse gas emissions with provincial, municipal and private-sector partners. There are currently two pilot landfill gas projects approved under the Green Municipal Investment Fund. Overall it is estimated that initiatives from these funds will reduce landfill emissions by 2.2 MT.

Next Steps

Analyses and inventories suggest that it is feasible to capture an additional 8 MT of landfill methane at relatively low cost.

Consult on whether to regulate landfills or incorporate into an offsets system

The Plan proposes that federal, provincial, territorial and municipal governments consult on whether emissions reductions from new capture and flaring or use of landfill gas should be eligible to be sold as offsets in a domestic emissions trading system, or whether regulation by the appropriate authorities is preferable.



G. International Emissions Reductions: Summary

The Kyoto Protocol creates a new international market for a new global commodity: international emission permits.

The Plan proposes that Canada participate directly in this international market and seek to do so in close collaboration with the private sector. Our objectives would be to:

- help developing countries reduce their greenhouse gas emissions
- maximize trade opportunities for Canadian goods and services
- help build an effectively functioning carbon market that will allow Canadian firms to purchase international permits at a reasonable price
- help risk-manage Canada's ability to reach its target

Actions Underway

- \$15 M investment in the World Bank's Prototype Carbon Fund (2 MT)
- \$100 M investment in capacity building activities in development countries through the Canada Climate Change Development Fund, the majority of which are creating an enabling environment for investment in additional credit-generation projects.
- \$20 M to enhance Canada's Clean Development Mechanism and Joint Implementation (CDM/JI) Office to facilitate Canadian private sector participation in international projects

Proposed Next Steps (10 MT)

- Consult the private sector on the best approach to work together in support of their investments and purchases on the international market
- Consider the purchase of a minimum of 10 MT of permits by the Government of Canada

International Emissions Reductions: Background and Details on Next Steps

The International Market for Carbon

The Kyoto Protocol creates a new international market and a new global commodity called international emissions permits. Canadian companies are already active players in this market, both buying permits for their own use and generating permits to sell to others. The international market for carbon will be an important means by which countries and companies can reduce global emissions and meet their Kyoto commitments as cost-effectively as possible.

The Kyoto Mechanisms

The Kyoto Protocol includes three market-based mechanisms designed to help industrialized countries achieve their Kyoto targets at the lowest possible cost and to help promote emissions reductions and sinks projects in developing countries and countries with economies in transition (EITs) to a market economy (Russia or countries of the former Soviet Union and eastern Europe). These mechanisms are accessible to countries and companies authorized by countries that have ratified the Protocol.

The first of these is the **Clean Development Mechanism** (CDM), through which Canada or Canadian firms could generate permits by investing in emissions reduction or sinks projects in developing countries that have ratified the Protocol. For example,

methane emissions from a landfill site on the edges of a large city might be used to generate enough electricity for a neighbouring town. Such a project both reduces greenhouse gas emissions and provides a secure energy supply at a reasonable cost – a key ingredient for improving quality of life and creating the potential for sustainable development.

The second mechanism is **Joint Implementation** (JI), through which Canada or Canadian firms could generate permits by investing in emissions reduction or sinks projects in other industrialized countries, including in EITs. For example, Canadian technology might be used to improve the seals and compression pumps on a pipeline in eastern Europe, thereby reducing fugitive emissions. Canada has state-of-the-art expertise and technology in this area that is already finding markets abroad. Reducing emissions from pipelines can lead to improved profitability and improved local air quality.

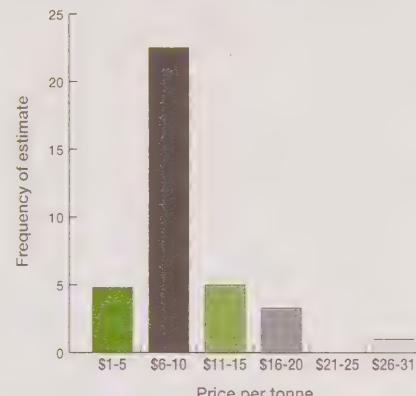
The third mechanism is **International Emissions Trading** (IET), through which Canada or Canadian firms can buy permits on an open market. The permits could be purchased directly or through an international broker.

One issue that has received considerable attention is the possibility of buying surplus permits from Russia and eastern European countries, where economic decline over the past decade has lowered their emissions below their Kyoto target. The Government of Canada has already indicated that it would buy such permits only if the selling country agrees to invest the proceeds from the sale in projects and activities that contribute to emissions reductions. This is called “greening” surplus permits and ensures that these purchases result in real environmental benefits that contribute to addressing climate change.

Actions Underway

Canadian companies are already investing in projects that are expected to qualify under the Clean Development Mechanism and Joint Implementation. They are making these investments for at least two reasons: these projects are profitable in their own right and the permits they will generate could be used to offset their own emissions or sold to other companies as an additional source of revenue.

Price Estimates per tonne of CO₂ in 2010



NatSource, April 2002.

To assist Canadian companies to gain access to this market, the Clean Development Mechanism and Joint Implementation (CDM/JI) Office was created in the Department of Foreign Affairs and International Trade. The Office negotiates bilateral agreements with host countries to help secure project approvals and provides technical and funding assistance for market identification studies, feasibility assessments, baselines and monitoring plans, as well as risk assessments and environmental impact studies. These services are aimed at facilitating projects and reducing transaction costs.

The Government of Canada is currently investing in projects that generate permits through a \$15 million share of the World Bank Prototype Carbon Fund (PCF). The PCF operates like a mutual fund, pooling the collective resources of a number of countries and companies and investing these funds into projects that reduce emissions or remove CO₂ from the atmosphere and enhance sustainable development. For example, the PCF could invest in an electricity generating station financed from other World Bank funds in order to install more expensive, but also more efficient and cleaner technology. The difference between the CO₂ emissions from the originally proposed generating station and the station that is actually built are the carbon permits that accrue to the Fund.

Next Steps

The Plan proposes that the Government of Canada participate directly in this international market and should seek to do so in close collaboration with the private sector. The Government has four core objectives.

First, there is tremendous potential to create carbon permits while also helping to build the capacity and experience in the developing world to manage and reduce greenhouse gas emissions. As a result, these countries will be better positioned to assume their own emissions targets in the years ahead.

Second, these projects can maximize trade opportunities for Canadian goods and services. It has been suggested that over the next eight years the international carbon market could grow into a US\$10 billion market, creating considerable growth potential for Canadian exports.

Third, it is important to ensure that the price of international permits is low and the cost of achieving our Kyoto target is reasonable. By being an active participant in the market, Canada can help to build what is now a thin, fledgling market into a more robust one where there is active permit trading and an ample supply of verified carbon permits.

Fourth, the international permits that the Government buys provide a buffer should the actions that will be taken under this Plan not yield the emissions reductions required for Canada to meet its Kyoto commitment.

Collaborate with Canadian firms in the international market

Canadian companies that would be covered by the proposed covenants and domestic emissions trading system may choose to be active in the international market as a way of offsetting some or all of their domestic emissions. Canadian firms might also decide to be active investors in international emissions reduction projects as part of their overall business operations.

A number of Canadian companies have expressed interest in collaborating with the Government of Canada to enhance their ability to use the Kyoto Mechanisms. Such collaboration could lower transaction costs by pooling private-sector and government expertise and purchasing power. The Government of Canada will consult on how such a collaborative mechanism could be designed.

Consider a minimum purchase of 10 MT of international permits

With the objectives outlined above in mind, the Government of Canada is prepared to consider the purchase of a minimum of 10 MT of international permits, with priority to be given to permits from CDM/JI projects. The Government will ensure that its own participation in the international market complements that of the Canadian private sector.



IV. Canadians, Communities and Governments: Each Doing Our Part

A. A Goal for Canadians

On average, each Canadian generates just over five tonnes of greenhouse gas emissions each year. Together, these account for more than a quarter of Canada's greenhouse gas emissions. Activities such as driving vehicles, heating and cooling homes, washing and drying clothes and using other appliances all use energy that may be generated by burning fossil fuels. This causes greenhouse gas emissions and also affects air and water quality. By taking small actions at work, at home and on the road, Canadians can reduce greenhouse gas emissions, while reducing air and water pollutants.

Individual Canadians can do their part in achieving our climate change objectives by establishing goals for reducing their greenhouse gas emissions. This Plan proposes an individual target of one tonne, recognizing that some Canadians will have scope to do more and others less.

How much is one tonne of greenhouse gases?

One tonne of CO₂, the main greenhouse gas, would completely fill the inside of an ordinary house.

Achieving this goal would reduce Canada's greenhouse gas emissions by more than 30 MT.

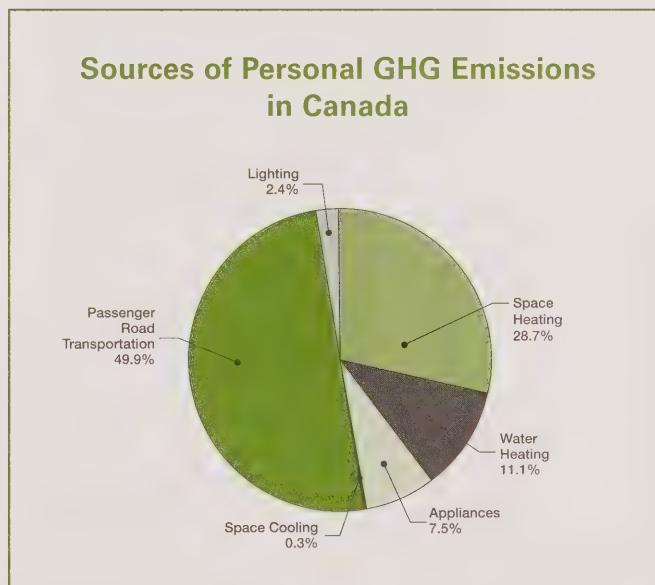
The measures contained in the Plan (see Section III) will help Canadians achieve the one-tonne goal. For instance, the Government of Canada will work with manufacturers to improve new vehicle efficiency, and provide support for increased public transit. Measures in the Plan will help increase the availability and use of

ethanol fuel by consumers. For homes, EnerGuide evaluations will be expanded. There is also a goal to have all new houses built to the R2000 energy efficiency standard by 2010.

Canadians need to know what actions they can take, what their impact will be, and how much, if any, investment on their part will be required. This Plan will build on current public education and outreach initiatives to provide Canadians with better information on how they can contribute. Through information websites and easy-to-use calculators, consumers will have the tools they need to quantify the actions they are taking.

Sources of Emissions

Most of Canadians' greenhouse gas emissions – about half – come from transportation. The remainder comes from heating and cooling homes, hot water, appliances and lighting.



Emissions arising from electricity use vary depending on where people live. Some provinces, such as Nova Scotia, Saskatchewan and Alberta, generate most of their electricity from coal, which is emissions-intensive. Other provinces, such as Quebec, British Columbia and Manitoba, generate most of their electricity from hydro, which has very low emissions. Reducing electricity use in these provinces will not have as significant an impact on overall emissions reductions, but it could create excess electricity that these provinces can sell to other markets, displacing coal-generated electricity.

Achieving the One-Tonne Goal: Practical Tips

What follows are some specific examples of steps individual Canadians can take to achieve their goal. Many of these steps are supported by measures outlined in Section III.

On the Road

Transportation accounts for half of individual greenhouse gas emissions. The kind of vehicle and the number of kilometres driven can have a huge impact on greenhouse gas emissions. Canadians can take many actions to reduce emissions from transportation.

- **Buy a fuel-efficient vehicle** – A 25 percent more fuel-efficient vehicle could reduce emissions by more than one tonne per year and save \$360 on an average annual gasoline bill of \$1440.
- **Use ethanol blend gasoline** – Current vehicles can use up to 10 percent ethanol blended gasoline without any adjustment to or effect on the engine.
- **Use the car less** – Driving 10 percent less, by walking, cycling, carpooling, or taking public transit, can reduce greenhouse gas emissions by 0.2 to 0.8 tonnes per year, depending on the vehicle.
- **Reduce idling** – If every Canadian motorist avoided idling their vehicles for just five minutes a day, all year, more than 1.6 million tonnes of carbon dioxide, along with other toxic substances, would not enter the air.

At Home

The average Canadian home produces six and a half tonnes of carbon dioxide every year. Space heating uses the largest amount of energy, so actions that reduce home heating requirements will have the greatest impact.

- **Retrofit older homes** – Homeowners can save an average of 25 percent per year on their energy bills by implementing the recommendations of an EnerGuide for Houses evaluation and reduce household emissions by more than 2 tonnes per year, depending on the type of home.
- **Buy an R2000 home** – An R2000 home uses 30 percent less energy than conventional new housing and can save 1-2 tonnes of greenhouse gas emissions per year. These homes also help save on annual heating and cooling bills and are more comfortable and healthier for living.
- **Be energy efficient at home** – Trim home heating bills by up to 10 percent and reduce emissions by up to 0.5 tonnes, by lowering the thermostat at night and when the house is unoccupied.
- **Replace appliances with more energy-efficient models** – A 2002 ENERGY STAR®-labeled refrigerator uses less than half the electricity of a 10 year old model, saving more than \$40 per year on a home energy bill and reducing emissions by more than 0.2 tonnes.

At Work

Canadians can also help to reduce greenhouse gas emissions by taking action in the workplace. These actions complement actions at home and on the road and contribute to reducing emissions in commercial and institutional buildings.

- **Use computer equipment wisely** – Computers and monitors account for approximately 7 percent of electricity consumption in a typical office. Reduce energy consumption and greenhouse gas emissions by enabling the monitor's energy saving features during the day, and turning the computer off every night.

- **Purchase more energy-efficient printers, computers, and photocopies** – ENERGY STAR®-labelled printers and photocopiers switch to ‘sleep mode’ after a preset period of inactivity, use about 50 percent less energy and generate less heat, thereby reducing cooling costs.

B. Community-Level Action

In Canada, sustainable community development is catching on. Municipal governments are taking actions to reduce greenhouse gases, both in their own operations and in the community at large. They are doing this to obtain the myriad of co-benefits that come from greenhouse gas reduction – cost savings, local economic development, improved local air quality and the health benefits that result and improvement in the quality of life for their citizenry. Municipalities are encouraging alternative forms of transportation, curbing urban sprawl, protecting and enhancing urban green space, using renewable forms of energy and performing energy-efficiency retrofits on buildings. With 80 percent of Canadians living in cities, municipalities have a vital role to play in tackling climate change.

The City of Calgary, for example, is purchasing 21 gigawatt hours of wind-generated electricity every year to power the city’s light-rail transit system. Calgary also uses solar energy to heat its municipal bus garages.

In Montreal, commuters are riding 155 biodiesel buses. The \$1.3 million BIOBUS project will help assess the environmental, economic and social advantages of using biodiesel in Canada. The result could be a new, less-polluting fuel and new opportunities for farmers.

In Halifax, an innovative strategy has been put in place for the on-site separation of wet, dry and recyclable waste at both residential and business sources. Operational since January 1999, the Halifax approach has diverted 43 percent of the waste that would normally have gone to landfill and reduced greenhouse gas emissions (mostly methane) by approximately 1.4 tonnes per resident based on the volume of organic materials diverted from the landfill.

From major cities like Toronto, Ottawa and Vancouver, to regional centres such as Sudbury and Windsor, to remote communities such as Fort McPherson and Oujé-Bougoumou, district or community energy systems are meeting heating, cooling and other energy needs in a more efficient manner. These systems use a central plant to meet the energy needs of buildings within a specific urban cluster, providing environment-friendly energy and substantial savings.

Budget 2000 established a number of new initiatives by the Government of Canada to assist Canadians and their communities in addressing climate change, including the Green Municipal Funds, expanded purchases of “green” power and renewal of the Climate Change Action Fund and energy efficiency and renewable energy programs.

Partners for Climate Protection (PCP) is a partnership between the Federation of Canadian Municipalities (FCM) and the International Council for Local Environmental Initiatives (ICLEI). It works to bring Canadian municipal governments together in efforts to improve environmental performance and quality of life by reducing greenhouse gas emissions from their operations and their communities as a whole. Under the initiative, communities set ambitious emissions reduction targets, develop action plans and monitor progress. PCP has been extremely successful, with 100 communities signed up across the country, including every capital in Canada. PCP communities represent nearly 50 percent of the Canadian population.

In addition, the Green Municipal Enabling Fund and the Green Municipal Investment Fund, managed by the FCM, have proven effective in stimulating community-based projects that reduce greenhouse gas emissions across Canada. The Green Municipal Enabling Fund supports communities in developing their own

innovation and climate change plans. No one knows better than communities themselves the particular strengths they have to offer and how they would like to develop in the future. By facilitating local level engagement, communities can secure buy-in from their industry, institutions and residents on the kind of community in which they want to live, invest, and grow.

The FCM believes that these initiatives will help Canada's municipalities reduce emissions by a further 10 MT over the next 10 years.

C. Aboriginal and Northern Communities

Aboriginal and northern communities face unique challenges. Mounting scientific evidence suggests that climate change may have a disproportionate impact on Canada's north, especially the western Arctic, which is experiencing some of the highest rates of ecosystem warming in the world.

The livelihood of many Aboriginal and northern residents comes from the land, water and natural resources, and will be compromised as ecosystems and wildlife are affected by climate change over time. In the north, melting permafrost could put buildings, pipelines, roads and other infrastructure at risk. Winter roads to remote Aboriginal communities may no longer be available or available only for shorter periods, thereby increasing the cost of supplying these communities.

Aboriginal peoples and northerners are already taking steps to reduce greenhouse gas emissions and to implement energy efficiency measures. At the same time, given the considerable potential for oil and gas as well as mining development and forestry, emphasis is also being placed on economic development and job creation.

It is essential that Aboriginal peoples and northerners have the tools they need to respond effectively to climate change through, for example, the promotion of alternative energy sources and the implementation of energy efficiency initiatives.

Governments are already collaborating in support of these objectives. The Canada-Yukon Energy Solutions initiative, for example, coordinates federal and territorial programs related to energy efficiency. In the Northwest Territories, the Arctic Energy Alliance acts as a service and program delivery agency. The Government of the Northwest Territories also encourages energy efficiency through its Building Operator Training Program.

Ongoing efforts will be required to ensure that Aboriginal and northern perspectives are incorporated into our national climate change strategy. The Aboriginal and Northern Climate Change Program has begun to address these priorities by funding community-based awareness and by building capacity to respond to climate change, encourage the use of renewable energy and address energy efficiency challenges, while seeking opportunities for Aboriginal participation in national and international initiatives.

The Partnership Fund will allow for funding new initiatives from Aboriginal and northern communities.

D. Leadership by Governments

Governments at all levels are consumers too, and all are taking action to reduce greenhouse gas emissions through the choices they make in their day-to-day operations. Some examples of provincial, territorial, municipal and federal actions are highlighted here.

Alberta has proposed completing energy retrofits in 190 government facilities, comprising 60 percent of the building space managed by government, installing cogeneration (combined power and heating from natural gas) units at government-funded research facilities, purchasing or leasing 100 new alternative fuel or hybrid vehicles for the government fleet over the next three years and ensuring new government

buildings and government-funded buildings are built to energy efficiency standards that exceed those of the Model National Energy Code for Buildings.

Nova Scotia's Leadership by Example initiative is developing a Provincial Buildings Initiative, with a view to realizing energy savings of 20 to 30 percent.

Manitoba's ethanol-blended gasoline purchase policy calls for all Manitoba government departments to purchase ethanol-blended fuel where it is reasonably available. A province-wide policy that will result in 10 percent ethanol in all gasoline used in vehicles is under consideration.

Perth, Ontario, is implementing its ecoPerth program with a target of reducing its greenhouse gas emissions by 20 percent by 2010. The City of Edmonton, Alberta, has adopted a greenhouse gas Emissions Reduction Plan for City Operations, which targets an annual reduction of 37,000 tonnes of CO₂ emissions from city services and facilities by 2008.

For its part, the Government of Canada has put in place its Federal House in Order program, under which the 11 largest-emitting departments and agencies will cut their emissions to 31 percent below 1990 levels by 2010. To date, participating departments have succeeded in reducing emissions by 21 percent. With this progress, and eight years remaining, we expect to be able to exceed our target and will be working to ensure this is the case.

In keeping with the proposed target in the Buildings section of the Plan, the Government will build all its new facilities to a minimum standard that is 25 percent better than the existing Model National Energy Code for Buildings and federal housing units will be constructed to meet the R2000 standard or equivalent. The Government will take advantage of opportunities to showcase best practices in greening the built environment and energy efficiency when undertaking projects in the Parliamentary Precinct. It is often the case that, through careful initial design, much more efficient and livable buildings can be constructed at no greater cost over the life cycle of the building. We will work to make such best practices become the norm for government construction.

The Government has already begun to retrofit existing government buildings to improve energy efficiency, financed through energy cost savings. To date, we have addressed 7,000 buildings with savings of \$24 million/year on our energy bills. For our major commercial buildings we will work towards retrofitting a further 20 percent. In government housing we will work towards the 20 percent retrofit target proposed for the country. In addition, the Government is considering how to strengthen energy efficiency requirements in major buildings it occupies under long-term leases.

In addition, all of the goods and equipment purchased for federal operations will meet the energy-efficient ENERGY STAR® standard through the incorporation of explicit specifications in all relevant purchasing decisions.

The proportion of lower-emitting vehicles in the federal fleet will also be increased as a challenge to other government and commercial fleets. Beginning with orders for 2004 model vehicles, the level of greenhouse gas emissions will be added to cost and fuel consumption as a mandatory criterion when making vehicle-purchasing decisions.

Under Action Plan 2000, the Government of Canada is moving to purchase 20 percent of its electricity requirements from renewable sources.

Because emerging energy technologies face significant market barriers, the Government will consider becoming a first purchaser of next generation power technologies and energy sources such as fuel cells and hydrogen, as well as other key enabling technologies such as advanced batteries and high-voltage electronics.

Last year, the Government of Canada's report under VCR Inc. attained gold-level status. We are participating in VCR Inc.'s initiative to develop even more rigorous reporting standards and intend to meet that new standard when it is implemented.

V. Improving Our Understanding of Climate Change and Preparing to Adapt

Since 1997, a great deal of work has been done to further our understanding of the state of Canada's climate, the sources of greenhouse gases and how they are absorbed in nature, the potential impacts of climate change and Canada's capacity to adapt. However, in order to make the most appropriate decisions on adaptation and future emissions reductions (post-Kyoto), additional information, based on further research, will be required.

A. Improving Climate Science

Understanding the climate system is a key scientific challenge in the international effort to address climate change. Given the magnitude of this challenge, early investments have been made, focussed on urgent policy needs such as carbon sinks and filling some of the gaps in climate observation. As a result of these investments, Canada has developed a significant capacity and reputation in climate change science. To build on these efforts, four priority areas for further action have been identified:

Addressing climate model uncertainties

Because climate change is a long-term issue, there is a need to better understand projected changes over the next 20 to 30 years. **Working collaboratively, Canadian government and university scientists could improve basic science studies and numerical models, giving greater precision to predictions about the rate and magnitude of climate warming.**

Provision of regional-scale climate change information

Global climate models have given us the big picture as to what future climate change will look like. Regional climate models could provide more detail as to where changes are likely to be most dramatic. These regional models, together with the broader modeling, will enhance seasonal climate forecasting and provide useful information for the purposes of adaptation in specific sectors such as agriculture and fisheries. **Further work is required to continue the development of a regional-scale model for Canada, in collaboration with the university community.**

Future evolution of climate in the Arctic

The Arctic is particularly sensitive to changes in climate. Arctic sea ice, for example, is expected to continue to decline. As noted, not only will this affect the global climate system, but there will be significant impacts on the environment, well-being and lives of the peoples of the circumpolar region, including Canada's North. The climatic processes that cause the decline in sea ice are not, however, fully understood. **A sustained international effort to improve our ability to project the future evolution of the Arctic sea ice is needed, and Canada would be expected to play a lead role in such a project.**

Determining the record of past climate variability and extremes

Additional research on the past climate record could provide more detail on the variability of Canada's climate, particularly in regions such as the Great Lakes and the Prairies. Partnerships with universities and the private sector could be strengthened and existing expertise and networks enhanced, with appropriate mechanisms to coordinate and set research priorities.

B. Assessing Climate Change Impacts and Preparing to Adapt

Due to past and current global greenhouse gas emissions, some adaptation to climate change will be required regardless of the success of actions to reduce emissions. Even if rapid and sustained emissions reductions are achieved, the impacts of climate change will continue to be felt for many decades and adaptation actions will be required.

Canada's climate change impacts and adaptation actions to date have engaged new researchers and stakeholders and started the process of building capacity in this relatively new, cross-cutting field. Canadian research on impacts and adaptation carried out since 1997 is being synthesized into a comprehensive report, with final publication due in 2003.

In addition, federal, provincial and territorial governments have supported the creation of the Canadian Climate Impact and Adaptation Research Network to link researchers and stakeholders. Two new research groups, OURANOS in Quebec and the Prairie Adaptation Research Collaborative (PARC), have been created to enhance research.

This Plan proposes that the collaboration among governments, academics and the private sector continue in order to advance readiness to adapt in four key areas:

- develop and research approaches to adaptation planning and tool development;
- expand assessment of vulnerabilities to climate change impacts to all areas of Canada, including the north and natural resources sectors;

- identify priority areas/regions where there is a need to consider future actions; and
- develop increased awareness of the impacts of climate change and the need to address them in the future through adaptation.

As we go forward, this Plan will be adjusted and improved to reflect changing circumstances. Further effort will also be required to enhance public awareness of climate change, and the actions required to adapt to it.

VI. Accountability



s noted, the Plan will evolve in the years ahead. We need to remain flexible enough to adjust to new circumstances, to respond to changes in market conditions and to capitalize on opportunities provided by the introduction of new technologies and innovation. We also need to take account of progress or difficulties as initiatives are implemented.

Underpinning global agreements, such as the United Nations Framework Convention on Climate Change and the Kyoto Protocol, are accountability mechanisms designed to ensure that Parties fulfil their obligations.

We will continue to meet our reporting obligations. In order to participate in the Kyoto Mechanisms, Canada will be required to comply with a variety of international monitoring, reporting and review requirements, such as the annual compilation and reporting of emissions inventories and the creation of a registry to rigorously track Canada's assigned amount of emissions permits. These requirements are essential to maintaining the environmental integrity of the Kyoto Mechanisms, and we will meet them fully.

Ontario already requires mandatory reporting of greenhouse gas emissions and Alberta is moving towards this as well. The Government of Canada is considering a nation-wide facility-based reporting system.

Working with other orders of government, industry and other partners, we will monitor both the economic and environmental effectiveness of the Plan's initiatives. This collaborative effort will help ensure that we strengthen initiatives and adjust our course where necessary. The continuous feedback from monitoring will enable us to keep the Plan "evergreen", to respond as necessary in the event of unwanted economic effects and to ensure that Canada meets its Kyoto target.

We will monitor emissions reductions from specific initiatives to see whether they are meeting program goals. Emissions reductions from specific measures must be measurable and verifiable. Measures not meeting expectations will be redesigned or reassessed. Areas that are exceeding expectations may see increased investment and effort. A variety of performance measurements will be designed to reflect the different sources of emissions and initiatives to reduce them. These performance measurements will be an important tool for projecting our emissions track and providing the time to adjust.

As part of recent federal investments to address climate change, two tools have been developed that will serve us well over the coming years.

The first of these is the Technology Early Action Measures (TEAM) program, which has developed a System of Measurement and Reporting. This system tracks the technical and greenhouse gas performance of projects such as fuel cell and biodiesel technologies.

The second is the Greenhouse Gas Verification Centre at Environment Canada, which will spearhead efforts to develop consistent standards, protocols and methodologies for calculating, measuring and verifying greenhouse gas emissions reductions, in collaboration with the Standards Council of Canada. It will also provide an information clearinghouse on these tools that can be used by all parties involved in emissions reduction activities.

We are making the investments now in measurement and verification technologies that will enable us to comply with the monitoring, reporting, and review obligations under the Kyoto Protocol. In collaboration with provincial and territorial governments, we will invest in the database and methodologies necessary for the accurate and timely measurement of our forest and agricultural sinks.

We will be rigorous in ensuring that Canadians are informed of our progress. Bi-annual reports will be made to the public, outlining the Plan's successes and describing its evolution as it is adjusted to meet new challenges. The first comprehensive Government of Canada report on the results of climate change efforts to date will be available next year.

VII. Conclusion



The Plan presented in these pages is a comprehensive approach to meeting our commitments under the Kyoto Protocol.

It recognizes that climate change is a global problem requiring a global response and that the Kyoto Protocol provides the opportunity for concerted international action.

It also recognizes that each of us has a role to play and a responsibility to assume – that everyone must be involved in this national project. While there will be economic impacts associated with achieving our climate change goals, these are expected to be manageable, as outlined in the Annex that follows.

At the same time, addressing climate change opens up exciting new opportunities – to become a more innovative economy, to establish Canada as a leader in the field of environmental technology, to develop a competitive advantage in the knowledge economy and to contribute to a better quality of life for all Canadians.

As the world makes the transition to a less carbon-intensive economy, those nations that lead this transition can reap enormous benefits. Canada must be among the leaders.

In the past, we have seen the private sector succeed in addressing environmental issues such as reducing ozone-depleting chlorofluorocarbons and acid rain. In each case, the challenge was met with creativity and costs were transformed into competitive advantages. We are confident that the same capacity for innovation will be brought to bear in addressing climate change.

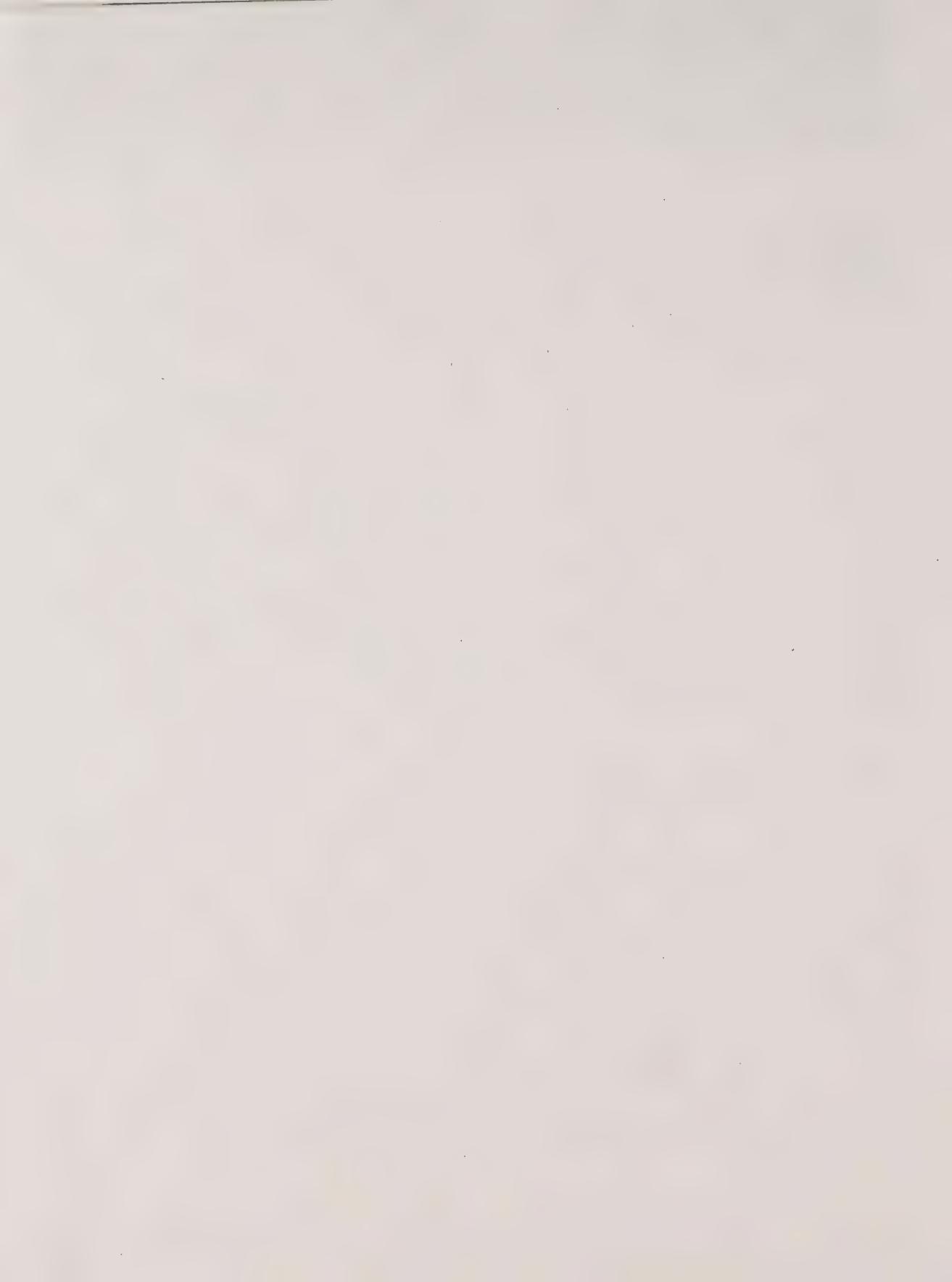
The Plan sets out a clear goal and proposes a path to take us there. But it is also built on a diversity of approaches, including a Partnership Fund, emissions trading and targeted measures, to minimize costs while meeting our commitment that no region should bear an unreasonable burden.

It is also a Plan that remains open to adjustment – one that can adapt to changing circumstances. This is crucial, because we cannot predict with precision the course technology will take or the opportunities innovation will provide.

Above all, it is a Plan made in, by and for Canadians, allowing us to pursue our own objectives in our own way. It reflects Canadian values and advances Canadian interests.

Going forward, we look forward to working with our provincial and territorial partners, as well as with industry and other interested parties, on the best means of implementing the Plan.

By applying our energy and imagination to the task at hand, we can enrich our lives, enhance our economy and expand our opportunities. We have much to gain, and little time to lose.



ANNEX: Analysis and Modeling of Cost Impacts

A

nalysis and modeling has provided critical support to the ongoing development of Canada's climate change policy. It has been used to produce integrated evaluations of the economic implications of various policy options to achieve Canada's Kyoto target. These evaluations have highlighted issues, which have, in turn, suggested extensions or alternatives to the policy proposals being developed.

This annex has several related objectives. The first is to provide a summary of the modeling and analysis activity since the negotiation of the Kyoto Protocol. The second is to describe the analytic framework developed to evaluate policy options. The third objective is to review and interpret the results of the most recent round of modeling. This recent work, undertaken by the Government of Canada, focused on the assessment of the so-called Reference Policy Package (RPP). The RPP broadly reflects federal thinking on the appropriate mix of policy instruments. It can perhaps best be interpreted as a variation of option 4 in the May 2002 *Discussion Paper on Canada's Contribution to Addressing Climate Change*.

I: Previous Analysis

In April 1998, federal, provincial and territorial energy and environment ministers (referred to as Joint Ministers) launched the National Climate Change Process (NCCP), a wide-ranging examination into the feasibility and implications of Canada's Kyoto Protocol target. In addition to creating a number of specialized Issue Tables, Ministers underscored the importance of rigorous economic analysis by establishing the Analysis and Modeling Group (AMG), a federal-provincial-territorial working group of economists. The primary responsibility of the AMG was to provide an integrated assessment of the economic implications for

Canada of various policy options to achieve the Kyoto target. The options themselves were suggested either by the Issue Tables or, more recently, by other working groups established to investigate specific policy alternatives.

The work of the AMG can be broadly divided into two phases. In the first phase, culminating in the October 2000 Joint Ministers' Meeting and the subsequent release of the AMG's report¹, the focus was on "range finding" – providing guidance to policy makers on the order of magnitude of some of the fundamental issues related to the achievement of the Kyoto target. In effect, the AMG was testing very broad policy approaches within a framework of different assumptions about the international dimensions of Kyoto, using a variety of modeling structures. The large number of combinations examined reflected, in large part, the many uncertainties associated with the Protocol at that time.

The AMG's range finding provided a number of useful insights for policy development. Perhaps the most important was to establish that the overall economic impact, across a large number of policy approaches, external assumptions and models, was in the range of 0 to -3 percent of gross domestic product (GDP) in 2010. This result, which suggests that, at most, the economy could be 3 percent smaller in 2010 as a consequence of achieving our climate change target than it otherwise would be, indicated an economic cost which, while of concern, was manageable. Other important findings from the first phase of analysis are as follows:

- the international carbon price is an important determinant of economic impact;
- approaches requiring each sector to achieve the same percentage target impose significant economic costs;

¹ Analysis and Modeling Group. *An Assessment of the Economic and Environmental Implications for Canada of the Kyoto Protocol*. National Climate Change Process, November 2000.

- most of the general approaches, particularly those that rely heavily on energy price increases to reduce GHG emissions via reduced fossil fuel use, result in considerable variability in impact across industries and provinces;
- emissions trading holds considerable promise as a cost-effective means of achieving emissions reductions; and
- agricultural and forest sinks are important to lower the overall cost of achieving the Kyoto target.

The second phase of AMG analysis began after the Bonn and Marrakech negotiations in late 2001. By establishing the rules regarding Kyoto Mechanisms and a framework for agricultural and forest sinks, these negotiations provided greater certainty as to the nature of the international “contract”. It was also clear, following President Bush’s announcement in March 2001, that the United States would not ratify the Protocol.

With the above issues clarified, it became possible to analyse policy options within a more informed set of external assumptions. The second phase of analysis was, therefore, largely focused on policy packages differentiated primarily by their reliance on, and approaches to, domestic emissions trading (DET). Emissions sources not covered by DET were addressed through initiatives such as incentives, regulations or information programs, which are referred to as “targeted measures”. The analysis centered on two cases:

- A “broad as practical” emissions trading system, in which permits are auctioned by government and the revenues returned, via reduced personal income taxes, to consumers.
- An emissions trading system covering the large industrial emitters in the electricity generation, oil and gas production, and energy intensive industries in which available permits are allocated free according to output growth. Specific targeted measures – about forty in total – are applied to the sectors not covered by the DET system (transportation, buildings, small industry and agriculture). The direct and indirect government costs are financed by raising personal income taxes.

These cases became, respectively, options 1 and 3 in the Government of Canada’s Discussion Paper on Climate Change released in May 2002. The results were presented at the May 2002 Joint Ministers’ Meeting and provided the basis for the stakeholder consultations in June of this year.

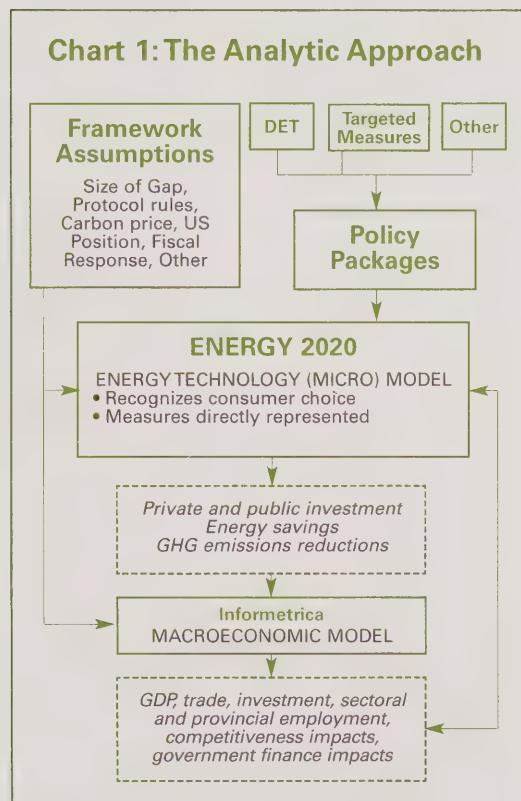
The results of the second phase of modeling provided many useful insights for policy development. Among the most important:

- Overall, the impact ranges from a slight positive effect on GDP under option 1 to -0.7 to -2.0 percent of GDP (in 2010) for option 3.
- Part of the difference is explained by different assumptions regarding international carbon prices (the analysis was carried out using two alternate price assumptions: \$10 and \$50 per tonne of CO₂). While the majority of expert opinion suggests a price near the lower end of the range, given the uncertainty on this matter, a range of prices was examined as prudent risk management.
- Most of the difference is related to the impact of the income tax changes (reduced in option 1, increased in option 3) to offset the impacts of the policy packages on the fiscal balances of governments. This fiscal assumption, although it has no direct bearing on emissions reductions, is a very important determinant of the economic outcome.
- The “broad as practical” emissions trading approach (option 1), although favourable overall, generates considerable variation in industrial and provincial impacts, largely because of its heavy reliance on energy price increases to achieve the emissions reductions.
- The large final emitter option (option 3) goes some way to address the competitiveness issues of manufacturing industries but needs further refinement (i.e., changes to measures that were modeled and/or new measures to moderate the impacts on oil and gas producers and electricity generators).
- Partly because of the effects on energy producers, option 3 results in somewhat larger negative impacts on Alberta, Saskatchewan and Newfoundland than on other provincial economies. The relative impacts are larger under higher permit prices.

These insights, along with the feedback from the stakeholder consultations, greatly assisted federal officials in developing a more articulated version of option 4, which had only been sketched out in the Discussion Paper. This articulated version is the Reference Policy Package described more fully in Section III of this Annex.

II: The Analytic Approach

The analytic framework is portrayed in Chart 1. Essentially it is comprised of three major components: a proposed policy package, a set of framework assumptions and a modeling structure.



Policy Packages

A policy package consists of a set of suggested government initiatives to reduce GHG emissions. A typical package contains some combination of an emissions trading system and a suite of targeted measures – information programs, regulations, mandates, incentives, partnerships, etc. – designed to achieve emissions reductions in specific sectors. Another possible element in the mix includes offsets (investments in emissions reductions outside the emissions trading system).

It should be emphasized that the models do not determine the policy package. The package is developed by analysts and senior officials who typically rely on expert advice on specific sectors. It is the role of the modeling to assess the overall impact of the package when all its components are allowed to interact with each other and with the broader economy. The modeling results are then used to inform and shape climate change policy and the Plan.

Framework Assumptions

The second major component of the analytic approach is the framework assumptions. Typically, these are either starting point assumptions or parameters that influence the results.

The most important starting point assumption is the “business as usual” (BAU) outlook, which projects emissions growth in the absence of additional policy initiatives. The difference, typically measured in 2010, between this BAU projection and the target Canada took on under the Kyoto Protocol (6 percent below 1990 levels) is the “gap” – a measure of the challenge facing Canada in achieving its Kyoto target. Based on a systematic review by the AMG earlier this year, the BAU projection for 2010 is 810 megatonnes (MT). Given our Kyoto target of 571 MT, the gap is currently estimated to be approximately 240 MT. In other words, in order to achieve its Kyoto target, Canada would have to reduce emissions in 2010, through a combination of domestic and international action, by about 30 percent from what they otherwise would have been.

One important contribution to reducing the gap is to recognize the contribution of forest and agricultural sinks from current practices (i.e. those sinks that would be created under the BAU projection). Based on analysis by the Canadian Forest Service and Agriculture and AgriFoods Canada (AAFC), the current analysis assumes 30 MT of sinks from current practices (20 MT from forests and 10 MT from agricultural soil management). Both the forestry and agricultural sinks are deducted from the national total for emissions.

Two other key assumptions influencing the results of a given policy package are the international carbon price and the way in which the government finances the policy package.

By removing the largest potential purchaser from the international permit market, the United States decision not to ratify the Protocol reduces the likely international carbon price. However, given the many uncertainties surrounding this embryonic market, policy options should be evaluated across a range of international carbon prices. Based on a workshop featuring international experts organized by the AMG in November 2001, the range selected for analytical purposes is CDN\$10 to CDN\$50 per tonne of CO₂. As noted, a subsequent review of international modeling results, expert opinion and other countries' views suggested that the balance of opinion favours a price near the low end of this range. Nonetheless, the Government of Canada believes that for prudent risk management the Reference Policy Package should be assessed under both prices.

For the financing assumption, the main issues are the most appropriate portrayal of the way in which governments fund large-scale initiatives and the likely fiscal situation over the period to 2012. To cover a range of possibilities, two financing assumptions were used in the analysis to finance the direct and indirect public costs of the RPP:

- Tax financed: all governments increase personal income taxes to maintain unchanged government balances.
- Government financed: the fiscal impacts of the policy package are allowed to directly affect government balances.

Alternative approaches, such as offsetting any fiscal impact by adjusting spending on existing programs, could also have been modeled but would require detailed assumptions as to which programs to change.

The government-financed rule results in reduced economic impacts because it avoids the negative effects of higher taxes. On the other hand, its application tends to slow the paying down of public debt. How the policy package is ultimately financed cannot be determined at this time. Future budgets will make the actual decisions as to how to finance the increased spending and accommodate reduced revenues.

The Modeling Structure

Due to the scope and complexity of emissions reduction policy, there is no one economic model that can adequately address all dimensions. To evaluate policy packages in a systematic fashion, the AMG linked a number of specialized private sector models into an overall modeling structure. In this way, the outputs of one model can be used as inputs to a second.

As shown in Chart 1, the current modeling structure, which was constructed during the second phase of AMG analysis, relies on two models:

- ENERGY 2020, an energy-technology model of Canadian energy markets developed and operated by the Policy Assessment Corporation and the Canadian Energy Research Institute (CERI)
- The Informetrica Model (TIM), a macro-econometric model of the Canadian economy developed by the Ottawa-based consulting firm Informetrica Ltd.

Both of these models are highly regarded, are based on a solid understanding of economic relationships and have been employed by numerous governments and stakeholders to provide economic analysis of public policy issues. Further, both models have been extensively reviewed by stakeholders through the AMG consultations. Finally, both offer a highly disaggregated structure, which permits examination of impacts at a relatively detailed industrial and provincial level.

As can be seen in Chart 1, the analysis process operates by first modeling the policy package in ENERGY 2020. The principal outputs from this model

are estimates of the private and public investment, energy savings/change in energy mix, permit transactions and emissions reductions associated with the policy package. The investment, energy savings and permit transactions then become inputs to the TIM model which estimates the impact on GDP, employment, trade, government finance and other measures of economic performance. The impacts of output, employment and investment changes are fully diffused across energy markets and the economy via a feedback mechanism between the two models.

III: The Reference Policy Package – Description

In the May 2002 Discussion Paper, the Government of Canada suggested that option 4, the Adjusted Mixed Approach, could form the basis for a workable approach to meeting Canada's Kyoto target. The consultations supported further examination of this option. Over the summer, federal officials developed a more articulated version of option 4, which also responded to some of the issues raised by the previous AMG modeling and to the views expressed during the stakeholder consultations. The result is the Reference Policy Package (RPP).

The RPP is not the Climate Change Plan for Canada described in this document. It is sufficiently similar, however, for its economic impacts to be viewed as broadly representative of approaches currently being discussed with industry and the provinces and territories.

The RPP is designed to achieve emissions reductions of 170-180 MT from the BAU projection in 2010 (i.e., similar in magnitude to the combination of Steps I and II in the Plan). It makes no assumption about how the balance of 60-70 MT to close the gap is achieved.

The RPP includes all the domestic measures announced in Action Plan 2000 and in the 2001 Budget. To achieve the remaining reductions, the package contains, in addition to the 30 MT of agricultural and forest sinks from current practices, three main components:

- a domestic emissions trading (DET) system for the use of large industrial emitters;
- about 40 additional targeted measures (some of which are enhancements of Action Plan 2000 measures); and
- a system of offsets.

To the extent that these measures are insufficient to achieve the required reductions, the RPP allows the Government to purchase international permits.

The three main components of the RPP are described below:

The DET System

The large industrial emitter emissions trading system applies to about 40 percent of emissions. It covers virtually all of the emissions from mining, iron and steel, pulp and paper, smelting and refining, industrial minerals, oil refining, pipelines and fossil-fuel electricity generation, emissions from about 70 percent of oil production and about 50 percent of those from natural gas production.

The BAU emissions from these large industrial emitters in 2010 are expected to be approximately 340 MT. The assumed overall target for the covered sectors in the RPP is about 260 MT, indicating an expected reduction of 80 MT from the DET sectors in this analysis (including the 25 MT expected to result from Action Plan 2000 and Budget 2001). This also means that about 75 percent of the overall permit requirement is provided free.

Within this overall target, permits are allocated free to each industry in a way that reflects emissions intensity, capacity to reduce emissions and forecast BAU output. Thus, subject to attaining the overall DET target, the number of permits allocated to each industry rises in proportion to its output. Through this output-based approach, industries are not exposed to the full cost of the additional permits required to match additional output. As a result, the output-based allocation approach goes a considerable distance in addressing the competitiveness concerns of fast-growing industries.

Targeted Measures

In addition to the Action Plan 2000 and Budget 2001 initiatives, the RPP includes about 40 measures designed to reduce emissions in the buildings, transportation, non-DET industry, oil and gas, and electricity sectors. These measures, which collectively are designed to achieve about 60-70 MT of emissions reductions, include regulations, incentives, information programs and partnerships. The most important targeted measures for each sector are:

Transportation: Incentives to accelerate vehicle scrappage, increase the use of biodiesel and other alternative fuels and improve truck technology, regulations and production incentives to increase the use of ethanol, and measures to expand urban transit

Buildings: New building codes for residential and commercial buildings, and for existing buildings, and incentives to retrofit 20 percent of all buildings

Industry not covered by DET: Extension of the CIPEC program

Oil and Gas: Incentives to reduce fugitive emissions and to encourage CO₂ capture and storage

Electricity Generation: Incentives to expand the market for renewable sources and for cogeneration, and subsidy to CO₂ capture and storage demonstrations

Offsets

The RPP includes a proposal to encourage the agriculture, forestry and landfill gas sectors to invest in emissions reductions or sinks with the objective of selling the resulting credits to entities covered by the DET system. Based on previous analysis, it is suggested that about 20 MT of such offset credits could be generated annually at a price of \$50 per tonne.

IV: The Reference Policy Package –Main Findings

The full set of results for the RPP is voluminous, covering 100-plus industries, a dozen fuel types and numerous representations of technologies, vehicles and building types for each provincial economy. This section provides only the main results.

Two points of orientation may be helpful. First, most of the results presented in the charts are differences relative to the BAU projection. Thus, a -1 percent for GDP in 2010 means that the economy in 2010 would be one percent smaller (in level, not growth rate terms) under the RPP than it would were the RPP not applied.

Second, to reflect some of the uncertainty surrounding key drivers of the results, all the charts provide estimates for the RPP under four carbon price/fiscal assumption scenarios:

- \$10 carbon price – government financing
- \$10 carbon price – tax financing
- \$50 carbon price – government financing
- \$50 carbon price – tax financing

The Government of Canada is of the view that the \$10 carbon price-government financing scenario is the more likely. Accordingly, the estimates for this scenario are highlighted in the following charts.

Chart 2 provides a snapshot of the RPP impacts under the four scenarios for the year 2010 (the midpoint of the first compliance period). Three points deserve emphasis:

- In terms of the impact on GDP, the range is from -0.4 to -1.6 percent. Given that the economy is predicted to grow by 18 percent between 2002 and 2010 in the absence of taking climate change action in the federal-provincial-territorial AMG base case, growth over the period would be 17.6 percent under the more likely scenario and still be at least 16.4 percent (18.0 – 1.6) under any scenario.
- The projected impact on employment, although of concern, is not large. Approximately 1.32 million jobs are expected to be created over the period 2002-2010. The RPP would, according to this analysis, reduce that growth to 1.26 million in the more likely case and to 1.08 million in the least optimistic case. This means foregone employment growth (not job losses) of about 60,000 under the most likely scenario.

Chart 2: Comparison of Impacts under Four Scenarios – 2002

	Percent change in GDP relative to BAU in 2010	Employment Growth 2002 to 2010 (Millions of jobs)	Disposable income per household
BAU		1.32	\$68,000
\$10 Case			
Government Financed	-0.4	1.26	\$68,000
Tax Financed	-0.2	1.13	\$66,700
\$50 Case			
Government Financed	-0.7	1.23	\$67,800
Tax Financed	-0.6	1.08	\$66,300

- Disposable income per household (the major determinant of consumer spending) is not affected in the government-financed scenarios. The reductions in the tax-financed scenarios are due primarily to the increases in personal income tax to maintain fiscal balances.

Charts 3 and 4 outline, respectively, the trends in GDP and employment impacts over time. The patterns across the four scenarios are essentially similar. The spike in 2003-2004 is largely related to increases in emissions-reducing machinery and equipment investment due to Action Plan 2000 and the additional targeted measures in the RPP (this result also suggests the need for care in staging the introduction of initiatives). The GDP and employment reductions for the \$10 carbon price-government financing scenario are uniformly smaller than those for the other scenarios. The major difference in impact occurs between the tax- and government-financed scenarios, suggesting the significant role played by the fiscal assumption.

This role is highlighted in Chart 5. In the tax-financed scenarios, disposable income is significantly affected by the increases in personal income taxes to finance the RPP. In the government-financed scenarios, there are no tax increases. Therefore disposable income is essentially unaffected.

Chart 3: Reference Case GDP Impacts

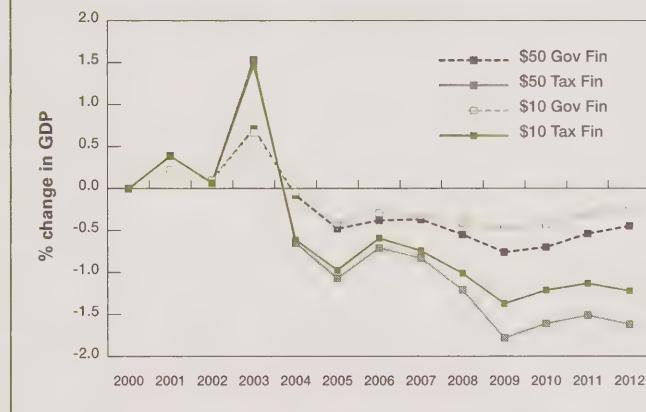


Chart 4: Reference Case Employment Impacts

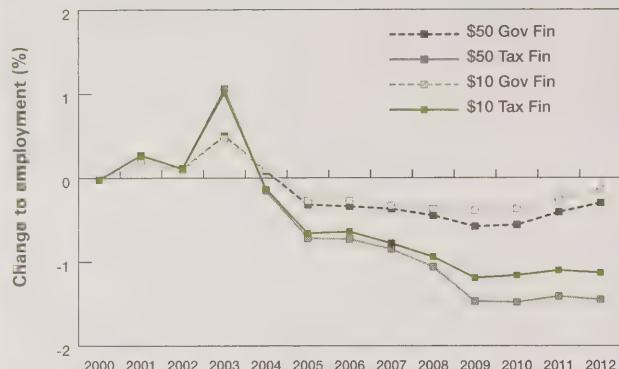


Chart 5: Reference Case Change to Disposable Income per Household

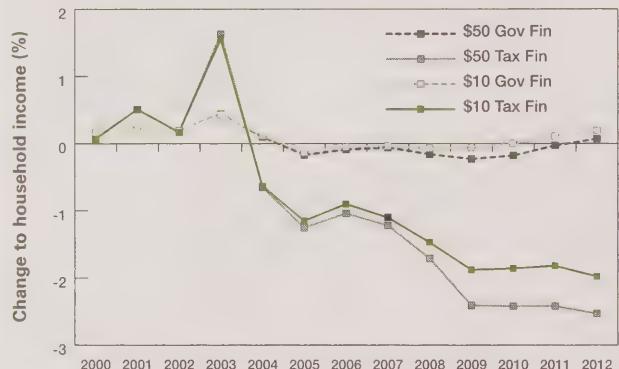


Chart 6 provides some results concerning the impact of the RPP on energy prices. With the exception of natural gas, energy prices are not greatly affected and are more or less insensitive to carbon prices or fiscal assumptions.

These results are due primarily to the design of the DET system, which applies the permit requirement on large industrial emitters rather than on the fossil fuels themselves. By contrast, other analyses that apply the permit system directly on fuels (i.e., on gasoline, heating oil, natural gas, etc.) typically show large price increases. The industries covered by DET only have a limited

ability to pass on higher energy costs through higher prices. Moreover, output-based permit allocation significantly reduces the costs borne by such industries because about 75 percent of their permit requirements are issued free.

Other points of interest concerning energy prices include:

- Gasoline prices do not increase both because of the financial support for ethanol and because refiners, faced with higher costs, choose to supply more of the market through imports.
- Natural gas prices increase because both the producing industry and the pipelines are covered by the DET system and incur some costs that they can pass on. The absolute increase in natural gas prices is similar in all provinces. However, the percentage increase is much higher in Alberta than in Ontario because the base price is lower due to the short pipeline distance.
- Electricity prices generally fall modestly in all regions. The reason for this result is primarily that there are many measures in the RPP focused on improving energy efficiency in other sectors. This improved efficiency serves to reduce electricity consumption in residential, commercial and industrial applications.

Chart 7 focuses on the industries covered by the DET system. These include the major energy-intensive industries and the energy supply industries (oil and gas, electricity and coal). Most of these industries are also very trade-sensitive. Also included in the list is motor vehicle manufacturing. This industry is not particularly energy-intensive, but it is trade-sensitive and can be significantly affected by measures directed at its products. The results suggest that the impact of the RPP on the motor vehicle industry is slightly positive because several of the urban transit measures directly stimulate vehicle demand. This also explains the slight stimulus to the steel industry.

The main message from all of these numbers is that the competitiveness issues of the heavy emitting industries appear to have largely been addressed by the design of the DET system. The impacts on output in all cases are relatively small, particularly so in the \$10 scenarios. In

Chart 6: Reference Case Energy Prices - 2010

	Percent change relative to BAU			
	\$10 Tax Fin	\$10 Gov't Fin	\$50 Tax Fin	\$50 Gov't Fin
Gasoline	0	0	0	0
Natural Gas				
Alberta	+8	+8	+46	+46
Ontario	+4	+4	+16	+16
Electricity				
Alberta	-7	-7	-2	-1
Ontario	-2	-2	0	0
Quebec	-10	-9	-7	-6

Chart 7: Reference Case Reduces Impacts on Energy Suppliers & Energy-Intensive Sectors

SECTOR	Percent Share of GDP	\$10 Tax Fin Change in output	\$10 Gov't Fin Change in output	\$50 Tax Fin Change in output	\$50 Gov't Fin Change in output
Metal mining	0.7	-0.1	-0.2	-0.4	-0.4
Non-metal mining	0.2	-0.6	-0.6	-1.7	-0.9
Pulp & paper	1.0	+0.1	+0.2	-0.1	+0.1
Primary iron and steel	0.6	+0.6	+0.4	+0.4	+0.3
Primary non-ferrous metals	0.7	-0.3	-0.3	-0.6	-0.6
Motor vehicles	2.5	+0.9	+0.9	+0.9	+0.9
Cement and clay products	0.3	-2.6	-2.4	-3.2	-3.0
Refined petroleum	0.3	-4.2	-3.1	-5.1	-3.8
Industrial chemicals	0.4	-0.1	-0.3	-0.9	-1.0
Oil and Gas	2.7	-0.4	-0.4	-2.1	-2.1
Electricity	2.3	-3.2	-2.8	-4.5	-3.8
Coal	0.2	-0.9	-0.9	-4.9	-4.8

Chart 8: Reference Case Impacts on the Canadian Economy in 2010

SECTOR	Percent Share of GDP	\$10 Tax Fin Change in output	\$10 Gov't Fin Change in output	\$50 Tax Fin Change in output	\$50 Gov't Fin Change in output
Energy suppliers	7.5	-2.1	-1.7	-3.6	-3.3
Energy-intensive and trade-sensitive sectors	6.7	+0.5	+0.5	+0.5	+0.6
Consumer goods & services	28.2	-1.2	-0.1	-1.6	-0.2
Construction	4.4	-3.8	-3.0	-4.7	-3.8
Transportation & storage	4.6	-1.0	-0.7	-2.2	-1.0
Communications	6.8	-1.4	+0.2	-2.9	0
Agriculture	2.0	-1.5	-0.8	-1.7	-0.7
Finance, insurance and real estate	15.5	-1.3	-0.5	-1.3	-0.5
Government & social services	14.3	-0.1	+0.1	-0.2	+0.1
Sub-Total	88.0	-1.1	-0.4	-1.6	-0.6

these scenarios, the effects on the oil and gas industry are modest. Only in the \$50 scenarios are the impacts on this industry discernible.

Among manufacturing industries, only cement and petroleum refining are significantly affected. For the former, the results reflect the particularly carbon-intensive production process. For petroleum refining, the relatively large impact relates to increased vehicle efficiency and the maintenance of imports at the expense of domestic production.

The industries on Chart 7 are very important to Canada's export performance and to investment. They account, however, for only about 15 percent of the economy. Chart 8 portrays the impact of the RPP on the other major sectors. The main differences in impact result from the fiscal assumption rather than the carbon price.

In the tax-financed scenarios, the requirement to raise income taxes to finance the policy and its consequences reduces disposable income and thus consumer demand. This, in turn, negatively affects industries dependent on consumer demand: consumer goods and services, communications, finance, insurance and real estate.

By contrast, this consumer effect is not present in the government-financed scenarios because taxes are not increased. Thus the more likely scenario is also one that minimizes the impact on consumers.

First Ministers agreed in 1997 that, under Canada's Kyoto policy, no region should bear an unreasonable burden. The impacts on provincial GDP, portrayed in Chart 9, suggest that the RPP comes close to attaining this objective. In the \$10 government-financing scenario, the variation in impacts is quite small (-0.5 percent for BC to +0.1 percent for Ontario), a difference that is not significant given the level of

Chart 9: Reference Cases Provincial Changes to GDP in 2010



precision of such models. The slight positive for Ontario is due largely to the stimulus to the transportation equipment and steel industries from several of the measures. In the \$10 tax-financed scenario, the impacts are both more negative and more uniform because of the slight depressing impact on consumer-oriented industries due to the tax increases. Only in the \$50 scenarios do more significant variations in impact start to emerge. Alberta is more heavily impacted as a result of reduced oil and gas activity. For BC, the impact is a combination of several influences, in particular, a decline in trucking activity due in part to higher costs and reduced demand in the lumber and wood products industry, which in turn is caused by reduced construction activity. This impact on construction is an area where further analytical work is required to better understand the detailed sectoral results, especially as home and building retrofits will be a significant part of the Plan and the modeling does not forecast any decline in personal disposable income. Labour representatives have expressed a particular interest in participating in this analysis.

The results for other provinces are close to the national average across the four scenarios.

V: Concluding Observations

The analytical approach used to estimate the economic impacts of the RPP is sound. Like all analytic undertakings of this scope, however, there remains considerable uncertainty – particularly regarding assumptions such as the international carbon price and the size of the gap. The modeling structure is well-regarded and has been vetted extensively by the provinces, territories and stakeholders.



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Budget 2003

Climate Change Investments to Date from Budget 2003

(funding commitments to date from Budget 2003:
\$2 billion total allocation to implementation of the
Climate Change Plan for Canada over five years)

Total investment
(millions of dollars)

Individual Canadians

One Tonne Challenge

- To challenge Canadians to reduce emissions by one tonne each, and provide them with the information and tools to achieve the goal 45.0

Extension of EnerGuide for Houses

- To cost share home energy audits that will recommend energy efficiency improvements 6.0

Retrofits of Existing Houses

- To provide incentives to encourage Canadians to make energy-efficiency retrofits of their homes 73.4

Marketing of Efficient Vehicles

- To encourage Canadians to purchase the most efficient vehicles that meet their needs by providing information and promoting use of more efficient vehicles 5.5

Labelling of Off-Road Vehicles

- Provide information to help Canadians make energy efficient choices in purchasing off-road vehicles, such as lawn mowers, all-terrain vehicles, and heavy construction equipment 1.5

Industry and Business

Energy-Efficient Buildings

Extension of Commercial Buildings Incentive Program

- Help build new commercial buildings to exceed the current Model National Energy Code for Buildings by 25 per cent 47.2

Extension of Energy Innovators Plus

- Encourage energy-efficiency retrofits of existing commercial buildings 56.6

Renewable Energy Deployment Initiative

- Encourage commercial buildings sector to make greater use of renewable energy heating and cooling systems in buildings 25.0

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Energy-Efficient Transportation

Commercial Transportation and Freight Efficiency

- Encourage commercial transportation sector to make greater use of alternative fuels and energy-efficient technologies 32.3

Natural Gas Vehicle Market Transformation

- Encourage increased production and use of natural gas vehicles for fleets 9.9

Expanded Use of Biodiesel

- Promote demonstration and commercial scale production of biodiesel 11.9

Ethanol Expansion

- Encourage construction of a number of ethanol plants and work with provinces and territories to provide encouragement to the development of a cellulose-based ethanol industry 100.0

Technology and Innovation

To reduce emissions over the long term and position industry to maximize economic opportunities in new technology development, particularly in five key areas:

Cleaner Fossil Fuels

- Technologies for cleaner fossil fuel production, conversion and combustion 65.0¹

Advanced End-Use Efficiency Technology

- Energy-efficient technology that can be used in the industrial, commercial, community and transportation sectors 40.0

Decentralized Energy Production

- Technologies that allow for greater use of locally available energy resources and renewable sources of energy, such as wind, solar and landfill gas 30.0

Biofuels

- A range of technologies, including biomass and waste conversions; cellulosic ethanol from biomass and other biofuels; bio processes; biomass production, harvesting and transportation; and energy from biomass 30.0

Hydrogen Economy

- Fuel cells and other technologies of the emerging hydrogen economy 80.0²

Technology Program Development

Forest 2020/Greencover

- Demonstrate effectiveness and encourage private investment in fast-growing tree plantations 20.0



Governments and Communities

Working with Provinces and Territories

- To support and collaborate with provinces and territories in moving ahead with priority emission reduction initiatives 160.0

Aboriginal and Northern Community Action

- Assist Aboriginal and northern communities in reducing emissions through greater energy efficiency, use of alternative sources, and improved energy use planning 30.7

Government of Canada Actions

- Towards 31 per cent emission reduction target in federal operations 50.0

Negotiations, international reporting and partnering support 80.0

Total Climate Change Investment In Today's Announcement **1,005.0**

Additional climate change investment in Budget 2003:

Sustainable Development Technology Canada

- Invest in development and demonstration of climate change technologies 250.0

Canadian Foundation for Climate and Atmospheric Sciences

- Continue research in climate change science 50.0

Total climate change investment to date from Budget 2003 **1,305.0**

¹ Does not include additional \$50 million to be invested in cleaner fossil fuels projects from \$250 million Sustainable Development Technology Canada allocation

² Does not include additional \$50 million to be invested in hydrogen economy-related projects from \$250 million Sustainable Development Technology Canada allocation

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Governments and Communities



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Governments and Communities— Doing Their Part to Address Climate Change

Governments and communities, as consumers of energy, contribute to Canada's greenhouse gas (GHG) emissions. Along with individual Canadians, industry and business, they must also do their part to address climate change and reduce GHG emissions.

The Government of Canada is investing just over \$320 million in initiatives to work with provinces and territories on cost-effective emission reduction initiatives, to assist Aboriginal and northern communities respond effectively to climate change, and in actions to bring down its own emissions.

Working with Provinces and Territories

Partnership with provincial and territorial governments is an essential part of the *Climate Change Plan for Canada*. Canada's provincial and territorial governments are already taking action to reduce emissions, and the Government of Canada is committed to introducing measures that can enhance these efforts, and to working with its provincial and territorial partners in a way that recognizes their specific priorities, and allows for complementary and coordinated action on GHG emissions.

The \$160 million Opportunities Envelope included in this new investment will provide additional flexibility to the provinces and territories as they continue to develop solutions that meet their specific needs and circumstances, and support national climate change goals at the same time. The Opportunities Envelope will also allow the Government of Canada to contribute to cost-effective emissions reduction initiatives brought forward by its provincial and territorial partners.

Provinces and territories will have further opportunities to undertake collaborative efforts

with the Government of Canada through the \$300 million being invested in emissions reduction measures, in areas such as buildings and transportation. All of these investments are designed to encourage partnership, build on existing efforts and reflect areas where there is agreement that further action is required.

The \$500 million federal investments in technology and innovation will also create opportunities for new partnerships, as will new Government of Canada investments in infrastructure. Budget 2003 allocated an additional \$3 billion to the Government of Canada's ongoing investment in the nation's infrastructure. This program will place an enhanced focus on projects that relate to helping meet Canada's climate change goals.

The Government of Canada is currently engaged in discussions with many provinces and territories with a view to establishing mutual priorities, and expects to conclude a number of memoranda of understanding by the fall.



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Aboriginal and Northern Communities

The Government of Canada supports efforts by Aboriginal and northern communities to improve their energy efficiency and use alternative energy sources. The \$30.7 million **Aboriginal and Northern Community Action Program (ANCAP)** will expand partnerships over the next four years with Aboriginal peoples and Canadians in northern regions to build an effective response to climate change, at the same time enhancing quality of life by reducing energy costs and improving local air quality.

Through the ANCAP, the Government of Canada will work with all Aboriginal and northern communities, with particular emphasis on supporting the approximately 130 remote, and Aboriginal and northern communities that rely on diesel generation as they work to improve their energy efficiency and adopt alternative energy sources to reduce their dependence on diesel fuel.

This new initiative will focus on four key areas to address climate change challenges facing northern and Aboriginal communities with action in

- community energy planning and management;
- renewable energy and improved technology applications (e.g., small hydro, wind, solar, variable generators);
- enhanced energy efficiency of existing and new Aboriginal facilities; and
- capacity building, training and tools.

The original \$3.7 million Aboriginal and Northern Climate Change Program was a successful pilot project initiated under the Government of Canada's Action Plan 2000 on Climate Change that helped Aboriginal and northern communities participate in climate change activities.

Government of Canada Actions

In asking all sectors and all Canadians to contribute to reaching our climate change targets, the Government of Canada recognizes it has a responsibility to reduce its own emissions. To show leadership and contribute to achieving our overall goals, the 11 federal departments that account for 95 per cent of all Government of Canada GHG

emissions have committed to reduce those emissions to 31 per cent below 1990 levels by 2010.

To ensure this goal is reached, the Government of Canada will invest a further \$50 million over five years to expand the **Federal House in Order** program, launched with an initial investment of \$44 million in 2001.

The 11 departments involved in this initiative have already reduced emissions by 24 per cent. These additional funds will ensure we meet, if not exceed, our goal.

Some of the specific measures the Government of Canada will take to put its own house in order include the following:

- Building all its new facilities to be 25 per cent more energy efficient than the existing Model National Energy Code for Buildings.
- Retrofitting a further 20 per cent of its commercial buildings by 2010 to improve energy efficiency, financed through energy cost savings. To date, 7000 federal buildings have undergone retrofits—about 30 per cent of the federal building stock. The retrofits have resulted in a total savings of \$27 million a year on energy bills and a reduction of GHG emissions of 20 per cent on average. The Government is also considering how to strengthen energy efficiency requirements in major buildings it occupies under long-term leases.
- Improving the energy efficiency of both existing and new housing that the Federal Government owns. For example, the Royal Canadian Mounted Police and Department of National Defence have both committed to building all new housing to the R-2000 or equivalent standard, have set a target for improving the energy performance of their portfolio of homes, and, as a first step, will assess 1100 houses and improve five per cent of housing stock in the coming year.
- Increasing the use of lower-emitting vehicles in the federal fleet and reducing GHG emissions from fleet operations. Specific measures for the federal vehicle fleet include the following:
 - Vehicles purchased for ministers and senior officials will be factory-equipped for natural



gas, propane, hybrid electric or E-85 (a blend of 85 per cent ethanol and 15 per cent gasoline), where fuelling infrastructure exists or is planned, or among the most efficient vehicles in their class.

- Drivers of Government of Canada departmental vehicles will fill up with E-10 (10 per cent ethanol-gasoline blend) whenever available.
- Starting in the 2004 model year, GHG emissions will be added to cost and fuel consumption as mandatory criteria when making vehicle purchase decisions. This means taking into account the class of vehicle appropriate for the use; purchasing a vehicle that is among the most energy efficient in its class, including hybrids as appropriate; and ensuring that new vehicles are equipped to run on natural gas, propane or E-85, where fuelling infrastructure exists or is planned.
- Continuing to work toward fulfilling our commitment to meet 20 per cent of federal electricity requirements from emerging low- or non-emitting sources.
- Basing the purchases of energy-using equipment on life cycle costs, which will include both operating energy costs and a value placed on the GHG emissions.

Purchases of energy-using equipment to models that meet at least Energy Star® or equivalent efficiency standards in all cases where such products are readily available and meet operational requirements. Energy Star® ranking has been assigned to a range of office and building

equipment, such as computers, printers, photocopiers, heating, cooling and ventilation systems and lighting products. Energy Star® or equivalent high efficiency criteria are being updated as the market evolves and new criteria are developed for additional products for the Canadian marketplace. A list of these products is regularly updated and available at www.energystar.gc.ca.

The Government of Canada encourages others to meet this procurement commitment.

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Industry and Business

Working with Industry and Business to Address Climate Change

Canadian business and industry are the backbone of our economy and fundamental to our quality of life. However, as they create new economic opportunities, new markets and new jobs, they also produce a significant amount of the greenhouse gas (GHG) emissions that contribute to climate change.

As with individuals, governments and communities, the *Climate Change Plan for Canada* describes a role for Canadian industry in reaching our climate change targets. The measures outlined in the Plan will allow this key sector to play its part in reducing emissions, while continuing to grow and prosper.

The Government of Canada will invest close to \$283 million to help business and industry reduce emissions using available technologies in areas such as the buildings and transportation sector. Emission reduction efforts in these sectors are in addition to the substantial emission reductions being sought from large industrial emitters.

The Government of Canada will also invest \$500 million towards the development of new technologies that will help to reduce our GHG emissions over the longer term, and help industry seize new economic opportunities. Of this, \$350 million, including \$100 million through an arm's length foundation, Sustainable Development Technology Canada (SDTC), will be focused on five key areas of technology. The remaining \$150 million will be invested more broadly through SDTC.

A further \$20 million will demonstrate the role fast-growing tree plantations can have in achieving climate change goals.

Buildings

The Government of Canada is asking the commercial buildings sector to make its buildings more energy efficient and to increase the use of renewable energy, and is investing \$129 million to help the sector achieve those goals.

- \$47 million will go to expanding the existing Commercial Buildings Incentive Program, which is aimed at making new buildings more energy efficient. Since 1998, this program has contributed to 260 new building projects, showing that it is possible to construct buildings that produce less than half the GHG emissions of standard buildings at little or no additional cost.
- \$57 million will be invested in expanding the Energy Innovators Initiative. This program encourages commercial businesses and public institutions to reduce energy consumption and increase energy efficiency in existing buildings. Since April 2001, 96 organizations have received almost \$14 million in funding under this program, investments that have led to more than \$250 million worth of energy-efficiency retrofits by building owners.
- \$25 million has been earmarked for the continuation of the Renewable Energy Deployment Initiative (REDI) until



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March 31, 2007. New spending for the current fiscal year will proceed while the Government of Canada re-evaluates the program and its objectives. Launched in 1998, REDI has played an important part in developing the growing market for reliable and cost-effective renewable energy technologies, including solar water and space heating systems, ground source heat pumps, and high-efficiency/low-emission biomass combustion systems. Funding details for future years will depend upon the results of an independent review, the results of which are expected by the end of the fiscal year.

Other Government of Canada renewable energy initiatives include the Wind Power Production Incentive (WPPI), ethanol and biodiesel initiatives, and tax and research and development supports. In light of the growing interest in wind energy, the appropriateness of the provincial caps under WPPI will be reviewed over the next year.

Transportation

A total of \$154 million will be invested in measures to support the efforts of Canada's transportation sector to reduce GHG emissions. These funds will support the efforts of industry to increase the supply of renewable and alternative fuels, such as ethanol and biodiesel, and the commercial transportation sector to make greater use of these fuels, as well as adopt other emission reduction technologies and improved fleet management techniques.

- \$100 million will be invested to assist in the construction of new plants that will greatly increase Canada's ethanol production capacity over the next three years. This is an important step towards the *Climate Change Plan for Canada* target of having at least 35 per cent of our gasoline supply contain 10 per cent ethanol (E10) by 2010.

A key element of the ethanol measure is the amendment of the Terms and Conditions of the National Biomass Ethanol Program extending its coverage from 2010 to 2014.

As part of this strategy, together with the provinces, the Government of Canada will examine, over the coming months, the range of programs that could be used to develop a successful commercial cellulose-based ethanol industry in Canada. The Government of Canada intends to pursue the examination of these options with representatives of the cellulose-based ethanol industry.

- \$32.3 million will be invested in the Commercial Transportation Energy Efficiency and Fuels Initiative. This investment will increase the market penetration of efficiency enhancing technologies, including anti-idling devices, in all modes. Technical workshops, training programs, and publications on preventive maintenance, fuel management practices, and better informed modal choice will also be part of this initiative.
- \$11.9 million will support research and provide incentives for industrial-scale biodiesel pilot plants, and support demonstrations of its effectiveness to encourage broader use of this cleaner-burning alternative to conventional diesel.
- \$9.9 million will be invested to reduce the cost of natural gas vehicles in urban fleets, such as taxis and delivery trucks. This measure will help to increase demand for these lower-emitting vehicles, and encourage manufacturers to increase production of these vehicles.

Technology and Innovation

The Government of Canada wants to help industry meet climate change targets, as well as lay the foundation for new, cleaner technologies and economic opportunities. The Government of Canada will invest a total of \$500 million in technology and innovation, including \$250 million allocated to SDTC in Budget 2003. Most of this investment will focus on five areas critical to achieving our climate change goals:

Cleaner Fossil Fuels

- \$115 million, including \$50 million in funding from SDTC, will be invested in the development and demonstration of cleaner fossil fuel technologies. These technologies allow for greater energy efficiency and environmentally benign production, conversion and combustion. This will result in lower GHG emissions, a greater emphasis on unconventional resources, with a focus on providing a clean, emissions-free development of Canada's fossil fuels.

Hydrogen Economy

- \$130 million, including \$50 million through SDTC, will be invested in building knowledge and accelerating the development and commercialization of fuel cells and other technologies in Canada that will form the basis of the emerging hydrogen economy, including technologies to produce hydrogen from renewable energy sources. In addition to promising long-term, sustainable solutions to climate



change, the hydrogen economy offers significant opportunity for businesses and communities across Canada. Investments will be available to support public- and private-sector partnerships to develop and demonstrate hydrogen technologies and infrastructure in integrated, real-world settings. Taken together, these investments will build on Canada's first-mover advantage internationally and ensure it remains at the forefront of the transition to the hydrogen economy.

Advanced End-Use Efficiency Technology

- \$40 million will be invested in the development and demonstration of energy-efficient technology that can be used in the industrial, commercial, community and transportation sectors. Examples include advanced industrial process technology, intelligent buildings and community systems management, low-energy lighting systems, low-emissions vehicles and more efficient transportation systems.

Decentralized Energy

- \$30 million will be invested in the development and demonstration of decentralized energy production systems. These systems make more efficient use of locally available energy resources and renewable sources of energy, such as wind, solar and landfill gas. They can be used in residential, commercial and industrial applications and in combined heat and power applications.

Biofuels

- \$30 million will go to support the development and demonstration of bio-based energy systems and technologies. This covers a broad range of technologies, including biomass and waste conversions; cellulosic ethanol from biomass and other biofuels; bio-processes; biomass production, harvesting and transportation; and energy from biomass. These technologies have great potential to reduce the use of fossil fuels. This investment is complemented by our investment in biodiesel technologies.

Sustainable Development Technology Canada

Within the \$2 billion allocated to climate change, Budget 2003 made a specific commitment of \$250 million to SDTC (as well as a specific reference of \$50 million to the Canadian Foundation for Climate and Atmospheric Sciences).

SDTC is an arm's-length foundation, established with an initial endowment of \$100 million, that invests in the development and demonstration of technologies related to climate change and clean air. From its new funding, SDTC is being asked to dedicate \$50 million to cleaner fossil fuel technologies and \$50 million to hydrogen technologies.

Since it was established in November 2001, SDTC has invested \$19.6 million in projects worth a total of \$71.4 million.

For example, SDTC recently invested \$3 million in funding three consortia. Bio-Terre Systems Inc. has developed an innovative solution for animal manure management. This technology will assure the sustainable development of the livestock production industry, since the use of the by-products will reduce GHG emissions by replacing non-renewable sources of energy and reducing consumption of chemical fertilizers. CO₂ Solutions Inc. has developed a biological system that recycles carbon dioxide (CO₂) into bicarbonate, an environmentally friendly by-product that can be commercialized. This technology can be used by industry—such as aluminum smelters, cement plants, power plants and paper mills—as well as for the recovery of biogas produced from waste landfills, and will permit a reduction of CO₂ emissions into the atmosphere. Mabarex Inc. has developed Dry-Rex™, an innovative, energy-efficient method of drying waste sludge that can be applied to a range of industrial and municipal processes.

Forests

The Government of Canada wants to work with the financial sector to invest in the planting of fast-growing trees on private land, and is contributing to a program to demonstrate the effectiveness of this strategy. The Government of Canada will contribute \$20 million to



Forest 2020/Greencover, a program that will demonstrate the possible contribution of fast-growing tree plantations to absorbing CO₂, and develop options to channel investments in additional plantations.

Forest 2020/Greencover will establish a series of fast-growing tree plantation demonstrations, mainly on private lands across Canada to demonstrate that trees, primarily fast-growing hardwood species, can help offset GHG emissions. Monitoring the best combination of seedlings, soils and climate will also be an opportunity to work with private industry to assess the economic and technical feasibility of using private lands to grow and harvest fast-growing plantations. This could lay the foundation for the development of many such plantations and contribute to reaching our climate change targets.

Co-benefits include demonstrating environmental stewardship, promoting innovation and creating new business opportunities in Aboriginal and rural communities. Forest 2020/Greencover will build on previous work to assess the feasibility of afforestation and take into account the portion of the Greencover Initiative aimed at expanding the amount of land in Canada covered by perennial forage and trees.

Large Industrial Emitters

The Government of Canada has set an emissions reduction target of 55 Mt for the large industrial emitters—the oil and gas sector, electricity, and mining and manufacturing sectors. They are vitally important to Canada's economy and response to climate change.

The Government is working closely with the large industrial emitters to help them minimize the cost of achieving their objective. We will ensure that a regulatory backstop will be as simple and transparent as possible. Covenants will be negotiated to deal with specific issues such as early action.

Since the release of the *Climate Change Plan for Canada*, meetings have been held with all of the relevant industry associations and many individual companies. The Government of Canada is committed to ensuring that industry has confidence in its competitiveness and is able to meet economic realities—while continuing to work toward our targets. For example, in a recent letter to the oil and gas sector, Prime Minister Jean Chrétien laid out principles that are intended to increase certainty in long-term development in the oil sector and help implement Canada's climate change goals.

The Government of Canada has already addressed some key concerns of large industrial emitters. Namely, we have committed to ensuring that Canadian companies will be able to meet their emission reduction responsibilities in the first commitment period at a price no greater than C\$15 per tonne; and with respect to the volume of emissions, the Government will set the emissions intensity targets for the oil and gas sector at a level not more than 15 per cent below projected business-as-usual levels for 2010.

Both industry and Government seek to minimize the cost of achieving emission reduction targets, while ensuring the financial viability of Canadian industry in highly competitive North American and world markets.

In addition, we are looking at how to work with provincial and territorial governments to streamline compliance by developing a joint system for measurement, reporting and verification that will provide the data needed to ascertain success.

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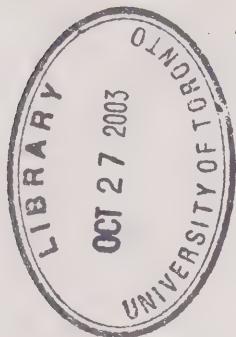


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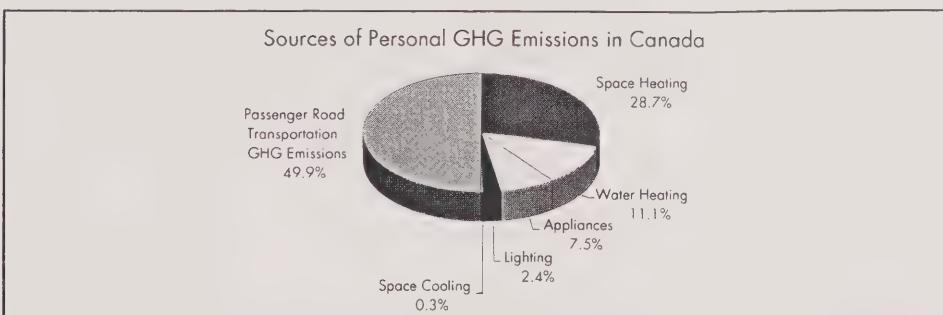
Achieving our Commitments Together



Partnerships

Climate Change Partnerships with Canadians

Each Canadian produces an average of five tonnes of greenhouse gas (GHG) emissions every year simply by driving cars, heating and cooling homes, washing and drying clothes and using other appliances. Added together, the emissions we are responsible for as individuals account for close to 25 per cent of all Canada's GHG emissions. Just like industry, government and communities, individuals play an important part in the emissions reduction strategy set out in the *Climate Change Plan for Canada*.



The *Climate Change Plan for Canada* asks each Canadian to reduce their emissions by 20 per cent —about one tonne. Naturally, some of us will be able to do more than others but it's important for each of us to do what we can.

Over the next five years, the Government of Canada is investing more than \$130 million in new measures that will help individual Canadians play their part in reaching our climate change targets.

The One Tonne Challenge

Canadians are being asked to set a personal goal of reducing GHG emissions by one tonne. To ensure Canadians have the knowledge, information, tools and opportunities they need to take effective action, the Government of Canada

will invest a total of \$45 million in the **One Tonne Challenge** consumer information campaign over the next three years.

The **One Tonne Challenge** will be launched this fall, with partnerships as a key component. Through the **One Tonne Challenge**, the Government of Canada is already consulting with major retailers, hotels, utilities, provincial and territorial governments, communities, environmental groups and others to explore ways to help Canadians make environmentally friendly transportation choices and purchasing decisions.

Home Energy Efficiency

Canadians are being asked to make their homes more energy efficient. The Government of Canada is investing \$79.4 million to encourage

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home energy-efficiency retrofits to reduce GHG emissions, and at the same time, help Canadians save money by lowering their energy bills.

Financial incentives will be offered to homeowners who make energy-efficiency improvements to their homes. This builds on two successful pilot projects run in Ontario. An EnerGuide evaluation will be part of the process for obtaining a financial incentive. The Government of Canada will share the cost of these home energy efficiency evaluations, which recommend retrofits that will save energy and money, and reduce GHG emissions.

Complete details will be released this fall, but the average homeowner's rebate is expected to be about \$1,000.

Other EnerGuide programs and the Energy Star® label also help Canadians make choices about energy efficiency when purchasing new appliances and vehicles.

On the Road

Individual Canadians are being asked to play a part in the national effort to reduce our transportation-

related GHG emissions by choosing more environmentally friendly fuels and by buying the most efficient vehicles to meet their needs. For most of us who own vehicles, close to half our individual GHG emissions are the result of the fossil fuels consumed by those vehicles.

A number of the new investments by the Government of Canada will help Canadians reduce their vehicle emissions. Among others, ethanol-blended gasoline will become more widely available. Using a 10 per cent ethanol blend gasoline reduces vehicle emissions of carbon dioxide—the major greenhouse gas.

The \$5.5 million **Marketing Efficient Vehicles Initiative** will make sure Canadians have the information they need to make the best environmental choice when buying a new car or truck, while the \$1.5 million **Labelling of Off-Road Vehicles** program will provide similar information for everything from all-terrain vehicles to lawn mowers.

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NEWS RELEASE

GOVERNMENT OF CANADA ANNOUNCES \$1 BILLION TOWARD IMPLEMENTATION OF THE CLIMATE CHANGE PLAN FOR CANADA

OTTAWA, August 12, 2003 - The Government of Canada today announced the details of the investment of \$1 billion towards the implementation of the *Climate Change Plan for Canada*. This investment is part of the Budget 2003 allocation and builds on \$1.7 billion the Government of Canada has invested in climate change over the past five years.

"Canada's approach to reducing greenhouse gas emissions is to think long-term and act short term," said Prime Minister Jean Chrétien. "This investment is an important step toward helping all Canadians reduce greenhouse gas emissions in the short-term, but will also open doors to tremendous economic opportunities over the long-term through research and technological innovations."

The investments are intended to act as a catalyst for, and a complement to, actions by individual Canadians; industry and business; and governments and communities.

- **Individual Canadians** – Incentives to encourage Canadians to make their homes more energy efficient, and investments in programs that will help Canadians make environmentally-friendly transportation choices and purchasing decisions (\$131.4 million).
- **Industry and business** – Help for business and industry to reduce emissions using available technologies in areas such as the buildings and transportation sector, and to work with the financial sector to invest in fast-growing tree plantations (\$302.9 million), as well as investments towards the development of new technologies that will help to reduce emissions over the longer-term and seize new economic opportunities (\$250 million). (This is in addition to \$250 million announced in Budget 2003 toward Sustainable Development Technology Canada and \$50 million towards the Canadian Foundation for Climate and Atmospheric Sciences).

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- **Governments and communities** – Funding for partnerships with provinces and territories on cost-effective emission reduction initiatives, as well as assisting Aboriginal and northern communities respond to climate change and demonstrating leadership by aggressively reducing Government of Canada emissions (\$320.7 million.)

"Past investments and those that we are announcing today will bring about real and significant reductions in greenhouse gas emissions which will help to improve quality of life for all Canadians," said Environment Minister David Anderson. "We are anxious to move ahead quickly with our partners on practical and cost-effective measures by taking full advantage of the opportunities presented for collaboration."

"Canadian businesses and industries will be able to seize the opportunities of emissions reduction, developing and bringing to commercial markets new products and methods, such as hydrogen technology, that will be needed as the world searches for answers to climate change," said Industry Minister Allan Rock.

"Today's announcement brings us closer to what the *Climate Change Plan for Canada* asks of Canadians to become the most sophisticated and efficient producers and consumers of energy in the world, and leaders in the development of new, cleaner technologies," said Natural Resources Minister Herb Dhaliwal.

Released on November 21, 2002, the *Climate Change Plan for Canada* is based on extensive consultations with provincial and territorial governments, industry, environmental organizations and individual Canadians. It sets out the strategy by which all Canadians and all sectors can work together to meet our Kyoto commitment to reduce greenhouse gas emissions to an average of six per cent below 1990 levels during the period 2008-2012.

Canada ratified the Kyoto Protocol on December 17, 2002. As of July 10, 2003, 111 countries have ratified or accessed the Kyoto Protocol.

The Government of Canada has committed more than \$3.7 billion to climate change programs and to the development of leading edge technologies over the past five years, including \$2 billion in Budget 2003 alone. Budget 2003 also allocated an additional \$3 billion to the Government of Canada's ongoing investment in the nation's infrastructure. This program will place an enhanced focus on projects that relate to helping meet Canada's climate change goals.

Today's announcement took place at the University of Ottawa's School of Information Technology and Engineering, which uses the most modern techniques and materials to minimize the cost of heating and cooling while maximizing the amount of natural light

available. The atrium on the building's south side has been hailed as one of the largest inhabited solar panels in the world.

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See the attached backgrounders for more information.

For information on the *Climate Change Plan for Canada*: www.climatechange.gc.ca

PMO Press Office: (613) 957-5555

This document is also available on our Internet site: <http://pm.gc.ca>

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(Également offert en français)

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Executive Summary



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Introduction

Addressing climate change presents Canada with both an important challenge and an exciting opportunity. Meeting this challenge and seizing this opportunity will require nothing less than a national effort – one that engages every Canadian and includes every region.

That process is well begun. From Iqaluit to St. John's to Tofino, Canadian households are already involved in protecting the environment: recycling, reducing and reusing. We now need to take the next step by improving the energy efficiency of our homes and making more informed choices when deciding what products and vehicles to buy.

Canadian companies are also at the forefront, developing new fuels and new technologies and cutting their greenhouse gas emissions while improving their bottom lines.

Provincial and territorial governments are moving to develop comprehensive strategies to help address climate change. They are implementing a range of measures to promote energy efficiency while investing in sources of renewable energy. Canada's cities are encouraging alternative forms of transportation, using renewable energy and retrofitting buildings.

This Plan builds on those efforts and sets out ways that will stimulate further action. In doing so, it charts a way to meet our international obligations, enhance our competitiveness and improve the quality of life for all Canadians.

The Science

The international scientific community has concluded that there is compelling evidence that human activity, particularly activities associated with energy use and deforestation, is accelerating the concentration of greenhouse gases in our atmosphere. There is general agreement that the global community faces the likelihood of increases in the earth's average surface temperature ranging from 1.4 to 5.8 degrees Celsius by 2100, with serious implications for global food and freshwater supplies, as well as many other implications.

In Canada we are already feeling the effects of climate change, in the form of:

- increasing number and intensity of heat waves and related health problems;
- declining water levels in the Great Lakes;
- changes in fish migration and melting of the polar ice cap;
- insect infestations in British Columbia's forests;
- hotter summers and higher levels of smog in major urban centres; and
- more extreme weather events such as droughts on the prairies, ice storms in eastern Canada, flooding in Manitoba and Quebec.



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As climate change-related events such as these become more frequent, they will have an increasingly profound effect on our economy, our health and our quality of life.

Our Canadian Approach

The overall approach outlined in the Plan reflects the principles suggested by provincial and territorial governments in their October 28th, 2002 statement on climate change policy.

For example, the Plan is consistent with principles articulated in that statement such as the sharing of benefits and burdens across the country, the importance of a made-in-Canada approach, the need to continue to pursue recognition for Canada's exports of cleaner energy and the necessity of recognizing early action by industry. Specifically, the Plan recognizes the importance of:

- a made-in-Canada approach based on collaboration, partnerships and respect for jurisdiction;
- no region bearing an unreasonable burden;
- taking a step-by-step approach that is transparent and evergreen;
- minimizing mitigation costs while maximizing benefits;
- promoting innovation; and
- limiting uncertainties and risks.

Proceeding on this basis will enable Canada to make a smooth transition to a more energy-efficient and less emissions-intensive society. This is a challenge that every country in the world will have to face in the coming decades. By acting now, Canadian companies and individuals can get ahead of the curve and create a sustainable competitive advantage. The development of new products and services, in turn, will stimulate economic growth, expand exports and create jobs for Canadians.

The Plan sets out a three-step approach for achieving Canada's climate change objective of reducing annual greenhouse gas (GHG) emissions by 240 megatonnes (MT). First, there are the investments to date that will address one third of the total reduction (80 MT). Second, it articulates a strategy for a further 100 MT reduction. And finally, it outlines a number of current

and potential actions that should enable Canada to address the remaining 60 MT reduction.

By necessity, the Plan will need to evolve over time. As new ideas emerge, new technologies are developed and better approaches suggested, we must be flexible enough to shift our resources from less effective actions to those with more potential to deliver emissions reductions.

Moving Ahead

The Plan proposes a national goal – for Canadians to become the most sophisticated and efficient consumers and producers of energy in the world and leaders in the development of new, cleaner technologies. To achieve our goal, the Plan proposes five key instruments:

- **Emissions reductions targets** for large industrial emitters established through covenants with a regulatory or financial backstop that would create an incentive for shifting to lower-emissions technologies and energy sources, while providing flexibility for these emitters through emissions trading and access to domestic offsets and international permits;
- **A Partnership Fund** that will cost-share emissions reductions in collaboration with provincial and territorial governments, as well as municipalities, Aboriginal communities, non-governmental organizations, and the private sector to increase energy efficiency and reduce emissions in the most effective way;
- **Strategic infrastructure investments** in innovative climate change proposals such as urban transit projects, intermodal transportation facilities and a CO₂ pipeline;
- **A coordinated Innovation Strategy** that allows Canada to benefit fully from the innovation possibilities of our climate change agenda and builds on programs such as Technology Partnerships Canada, the Industrial Research Assistance Program (IRAP), Sustainable Development Technology Canada and the Technology Early Action Measures (TEAM); and
- **Targeted measures** including information, incentives, regulations and tax measures that will help achieve our climate change objectives in specific sectors and program areas.

Key Areas for Action in the Plan

Using these tools, the Plan identifies action in five broad areas: transportation, housing and commercial/institutional buildings, large industrial emitters, small and medium-sized enterprises, and the international market.

Transportation

The Plan takes investments already in place and sets out further measures to improve fuel efficiency, expand the use of ethanol and other low-carbon fuels and promote more energy-efficient urban and freight transportation. In particular, the Plan:

- renews our commitment to working with automotive manufacturers to improve new vehicle fuel efficiency by 25 percent by 2010 and proposes additional steps to encourage consumer demand for more efficient vehicles;
- commits to new investments to increase the use of public transit and manage growth in vehicle use;
- sets the goal of increasing the amount of gasoline containing 10 percent ethanol blend to 35 percent of the market, in collaboration with the provinces and territories, and the amount of biodiesel production to 500 million litres; and
- proposes improved performance targets and best practices for all freight transport, and enhanced intermodal infrastructure.

Housing and Commercial/Institutional Buildings

Canadians have a tremendous opportunity to become more energy efficient and lower their home energy costs by taking a number of basic steps around their homes. The Plan will create the conditions for more informed choices and actions by:

- expanding cost-shared home energy audits for homeowners; and
- providing information to encourage consumers to purchase energy efficient appliances and equipment.

The Plan also proposes that governments work towards the following goals:

- energy efficient retrofits of 20 percent of the housing stock and 20 percent of the commercial/institutional building stock by 2010; and

- building all new homes to R2000 or equivalent standard by 2010 and all new commercial/institutional buildings to a minimum of 25 percent above the Model National Energy Code by 2010.

Large Industrial Emitters

This Plan proposes a comprehensive approach to the large industrial emitters sectors. The three-pronged strategy, which is being developed in consultation with the provinces, territories and industry, involves:

- emissions targets established through covenants with a regulatory or financial backstop in consultation with industry, provinces, and territories;
- domestic emissions trading, with access to offsets and international permits; and
- cost-shared strategic investments in a number of areas such as:
 - renewable energy;
 - clean coal demonstration projects; and
 - a CO₂ pipeline.

Small and Medium-Sized Enterprises (SMEs) and Fugitive Emissions

Small and medium-sized enterprises and other low-emissions businesses can play an important role in achieving our climate change objectives through voluntary energy efficiency improvements. The Plan will:

- expand the Canadian Industry Program for Energy Conservation (CIPEC) to include SMEs;
- cost-share energy efficiency audits;
- continue to provide information and assistance, through the Industrial Research Assistance Program, on the best energy efficiency technology available to small manufacturers; and
- promote practices to reduce flaring and venting of waste gases.

International Emissions Reductions

The Plan builds on the efforts of Canadian businesses that are already active in the international emissions permit trading market. This will help developing countries chart a lower emissions path while creating profitable business opportunities for Canadian companies. To achieve this, the Government will:

- work with the private sector to establish a mechanism for efficient engagement in projects in developing countries; and
- consider the purchase of a minimum of 10 MT of international permits.

Canadians, Communities and Governments

Seizing the opportunity to reduce emissions will require the collective effort of all Canadians. The Plan:

- proposes a personal goal for each Canadian to reduce emissions by an average of one tonne per year by 2008-2012, supported by incentives, improved information and product availability;
- emphasizes partnership with provinces, territories, communities, the private sector and non-governmental organizations to further reduce emissions through a variety of means including waste diversion and land-use planning;
- commits to ongoing collaboration with Aboriginal and northern communities to build capacity to address their particular priorities; and
- invites governments at all levels to lead by example.

Cost Estimates

Economic modeling suggests that these actions should not increase fuel prices significantly and many of the actions could result in lower energy bills – for both business and consumers – through greater energy efficiency.

Overall, the economic modelling suggests that the impact of taking action on climate change is manageable. In the most likely scenario, Gross Domestic Product (GDP) is reduced by only 0.4 percent in 2010. In other words, rather than growing by 1.8 percent between 2002 and 2010, the economy would grow by around 1.76 percent. Employment would increase by 1.26 million jobs instead of 1.32 million. Personal disposable income would not be affected.

Meeting Canada's climate change goals calls for new directions to be set and new strengths to be developed. It requires the best of our citizens and scientists, our innovators and entrepreneurs. It is an opportunity to enhance both the competitiveness of our economy and the quality of our lives: a national project worthy of a great country.

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Canada and the Kyoto Protocol



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Overview: Climate Change Affects Us All

Climate change is a global problem, affecting all countries. While greenhouse gases (GHGs) form naturally, many human activities add additional GHGs to the atmosphere. Heating and cooling buildings, using energy at home and work, driving vehicles to move people and goods, powering industrial processes – most things we do that consume energy contribute to the problem. Radiation from the sun enters the earth's atmosphere, and GHGs act like a greenhouse's glass to block this heat from escaping back to space. There is a direct link between rising atmospheric GHG concentrations, particularly carbon dioxide (CO₂), global warming and more frequent extreme weather events. In Canada, climate change will affect fishing, farming, forestry, lakes, rivers, coastal communities and the North.

The Kyoto Protocol

Countries around the world have recognized the urgent need to take action to reduce GHGs in order to address the climate change challenge.

In December 1997, Canada and more than 160 other countries met in Kyoto, Japan, and agreed to targets to reduce GHG emissions. The agreement that set out those targets, and the options available to countries to achieve them, is known as the Kyoto Protocol. Canada's target is to reduce its GHG emissions to 6 percent below 1990 levels by the period between 2008 and 2012.

The Protocol will only become legally binding when it is ratified by at least 55 countries, covering at least 55 percent of the emissions addressed by the Protocol. As of November 13 2002, 97 countries had ratified or acceded to the Kyoto Protocol, accounting for 37.4 percent of the emissions addressed by the Protocol.

All the countries of the world have been meeting every year since the signing of the Kyoto Protocol in 1997 to define the operational rules of the Protocol – in other words, the international administrative framework within which countries will take steps to meet their Kyoto targets.

A vision for a cleaner future

It is Canada's intention to create a Canada for this and future generations with clean air, clean water, livable cities and healthy people. Canada's Climate Change Plan aims to help us all rethink the way we use energy. It balances the challenges presented by climate change with opportunities to create a strong Canadian presence in new markets. It envisions an economy that is based on cleaner energy using leading edge technologies. It envisions a Canada that is strongly competitive as a result.



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Principles

The principles of fairness, sharing and no unreasonable burden are a foundation of Canada's Climate Change Plan. All governments, whether federal, provincial, territorial or municipal must act. All sectors must do their fair share. Consumers must do their part and business and industry must do theirs.

Action must be taken step by step. The Draft Plan recognizes that the Kyoto commitment period from 2008 to 2012 is but the first phase of the process.

After 2012, there will be another commitment period, then another, then another, each one building on the last, each one making a difference. As time goes by, we will assess our progress, learn as we go, make adjustments and capitalize on new developments and opportunities. It is our intention to minimize cost and maximize benefits. Why waste energy? Now is the time to take our first steps to a cleaner future.

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A Challenge for Canadians

On average, each Canadian generates just over five tonnes of greenhouse gas emissions each year. Together, these account for more than a quarter of Canada's greenhouse gas emissions. Activities such as driving our vehicles, heating and cooling our homes, washing and drying clothes and using other appliances all use energy that is generated by burning fossil fuels. This causes greenhouse gas emissions and also affects the quality of our air and water. By taking small actions at work, at home, and on the road that reduce our greenhouse gas emissions, we can also reduce the pollutants that harm the air we breathe and the water we drink.

Individual Canadians can do their part by establishing their own goals for reducing their greenhouse gas emissions as their contribution toward achieving our climate change objectives. This Plan proposes an individual target of one tonne, recognizing that some Canadians will have scope to do more and others less.

How much is one tonne of greenhouse gases? One tonne of carbon dioxide, the main greenhouse gas, would completely fill the inside of an ordinary house.

Achieving this goal would reduce Canada's greenhouse gas emissions by more than 30 megatonnes.

The measures contained in this plan (see Section III) will help Canadians achieve the one tonne goal. For instance, the Government of Canada will work with manufacturers to improve new vehicle efficiency, and provide support for increased public transit. Measures in the plan will help increase the availability and use of ethanol fuel by consumers. For homes, EnerGuide evaluations will be expanded. There is also a goal to have all new houses built to the R-2000 energy efficiency standard by 2010.

Canadians need to know what actions they can take, what their impact will be, and how much, if any, investment on their part will be required. This Plan will build on current public education and outreach initiatives to provide Canadians with better information on how they can contribute. With the help of transportation and housing measures provided in the plan and through information websites and easy-to-use calculators, consumers will have the tools they need to quantify the actions they are taking.



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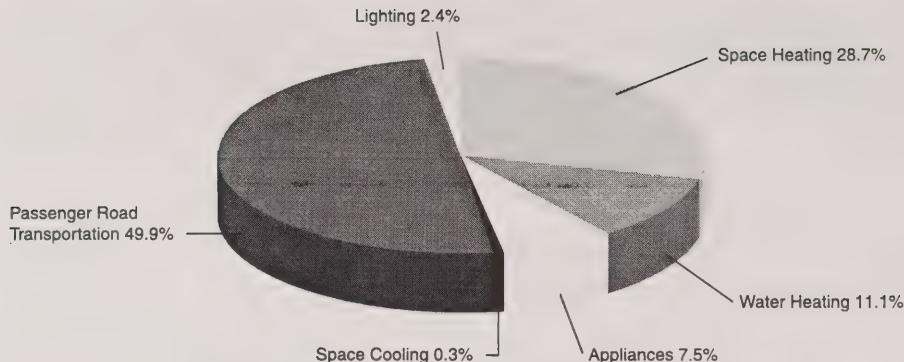
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Source of Personal GHG Emissions in Canada



Sources of emissions

Part of reducing emissions is understanding where they come from. The majority of Canadians' greenhouse gas emissions—about half—come from transportation. The second-largest source of emissions is heating our homes. Heating water, using appliances and lighting, and cooling our homes are the other most frequent sources of emissions.

Emissions arising from electricity use vary depending on where in Canada people live. Some provinces, such as Nova Scotia, Saskatchewan and Alberta, generate most of their electricity from coal, which is emissions-intensive. Other provinces, such as Quebec, British Columbia and Manitoba, generate most of their electricity from hydro, which has very low emissions. Reducing electricity use in these provinces will not have as significant an impact on overall emissions reductions, but it could create excess electricity these provinces can sell to other markets, displacing coal-generated electricity and generating economic benefits as well as cleaner air.

Achieving the one-tonne goal: practical tips

What follows are some specific examples of steps individual Canadians can take to achieve their goal.

On the road

Transportation accounts for half of individual greenhouse gas emissions. The kind of vehicle you drive, and how many kilometres you drive it, can have a huge impact on the greenhouse gas emissions that you produce. As noted previously, a typical late-model sport-utility vehicle driven 20,000 km a year produces about 6 tonnes of carbon dioxide, compared to 4 tonnes for a recent mid-sized sedan, and just 2 tonnes for a gasoline-electric hybrid vehicle.

- **Buying a fuel-efficient vehicle** – The average automobile lasts 10 years or more, so the kind you buy will have long-term consequences for our environment. Buying the smallest vehicle that suits your needs, and shopping for the most fuel-efficient vehicle within its class, can make a big difference to your emissions. A 25 percent more fuel-efficient vehicle could reduce emissions by more than one tonne per year and save \$360 on an average annual gasoline bill of \$1440. The EnerGuide label on new vehicles provides information about the estimated fuel consumption and the annual fuel cost. Or, if you are buying a used vehicle, consult the Fuel Consumption Guide for that model year at www.oee.nrcan.gc.ca/vehicles
- **Using ethanol blended gasoline** – Using a 10 percent blend of ethanol in gasoline can reduce greenhouse gas emissions by 0.2 tonnes annually. Current vehicles can use up to 10 percent ethanol blended gasoline without any adjustment to or effect on the engine.
- **Use the car less** – In a single year, the average vehicle produces about three times its own weight in greenhouse gas emissions. Driving 10 percent less by walking, biking, carpooling or taking public transit can reduce greenhouse gas emissions by 0.2 to 0.8 tonnes per year, depending on the vehicle.
- **Reduce idling** – If every Canadian motorist avoided idling their vehicles for just five minutes a day, every day of the year, more than 1.6 million tonnes of carbon dioxide, along with other toxic substances, would be spared from entering the air.
- **Getting regular maintenance checks** – Follow the recommended maintenance schedule in your owner's manual to keep your vehicle operating at

peak fuel efficiency. This, along with monthly tire pressure checks could reduce fuel consumption by 5% and reduce greenhouse gas emissions by 0.3 tonnes per year.

At home

The energy Canadians use in their homes – for heating, air conditioning, appliances, lighting and other uses – accounts for the other half of personal greenhouse gas emissions after transportation. The average Canadian home produces six and a half tonnes of carbon dioxide every year. Space heating uses the largest amount of energy, so actions that reduce home heating requirements will have the greatest impact.

- **Retrofitting your house** – Homeowners can save an average of 25 percent per year on their energy bills by implementing the recommendations of an EnerGuide for Houses evaluation. Created by Natural Resources Canada, this service provides an expert energy evaluation of your home including advice on the greatest opportunities to save energy. On average, implementing EnerGuide for Houses recommendations can reduce household emissions by more than 2 tonnes per year, depending on the type of home. For example, thorough draft-proofing can save almost 1 tonne of CO₂ and adding insulation to the attic could save at least another tonne. Replacing your existing furnace with a new high efficiency furnace could save 3 tonnes a year. (To find out how to obtain an EnerGuide for Houses evaluation, visit www.oee.nrcan.gc.ca/houses.)
- **Buying an R-2000 home** – The R-2000 standard is a Canadian initiative that promotes cost-effective and energy-efficient houses. An R-2000 home uses 30 percent less energy than conventional new housing and can save an average of two tonnes of greenhouse gas emissions per year. These homes cost less to operate and at the same time are more comfortable and healthier to live in.
- **Energy efficiency at home** – Using a programmable thermostat to lower the heat at night and when the house is unoccupied, operating the dishwasher only when it is full, and using compact fluorescent bulbs can reduce energy bills and emissions. You can trim your heating bills by up to 10 percent, and reduce your emissions by up to 0.5 tonnes, just by lowering your thermostat at night or when the house is unoccupied.

- **Replacing appliances with more energy-efficient models** – Newer appliances can substantially reduce your emissions. For example, a 2002 ENERGY STAR® refrigerator uses less than half the electricity of a 10 year-old model, saving more than \$40 per year on a home energy bill and reducing emissions by more than 0.2 tonnes.
- **Buying electricity from renewable sources** – In some areas of Canada, consumers can choose emission-free sources of electricity such as wind power rather than from high carbon sources such as coal. Replacing 10 percent of current residential purchases of high-carbon electricity with power from renewable sources could reduce emissions by 3 MT per year in Canada.

At work

Canadians can also help to reduce greenhouse gas emissions by taking action in the workplace. These actions complement actions at home and on the road and contribute to reducing emissions in commercial and institutional buildings.

Whether it is simple acts such as recycling, turning off your computer at the end of the day, using your own utensils or coffee mug instead of plastic and polystyrene or more complex ones, such as choosing environmentally-responsible materials for a new building or procuring fuel efficient vehicles – Canadians can make a real impact on the environment while they are at work or in their home office.

- **Using computer equipment wisely** – Computers and monitors account for approximately 7 percent of electricity consumption in a typical office. Research shows that most people leave their computer on throughout the business day, including lunchtime and meetings, while the typical computer is used an average of 4 hours a day. Therefore, over half of the energy used by the computer is wasted. You can reduce your energy consumption and greenhouse gas emissions by enabling the monitor's energy saving features during the day, and turning your computer off every night. When an energy efficient computer and monitor enters "stand-by" mode, it typically drops to 50 percent of its maximum power consumption.

- Purchasing more energy-efficient printers, computers, and photocopiers – ENERGY STAR®-labelled printers and photocopiers switch to ‘sleep mode’ after a preset period of inactivity, use about 50 percent less energy and generate less heat, thereby reducing cooling costs. An ENERGY STAR®-qualified computer/monitor combination can save about 75 kilograms of CO₂ compared to conventional products.

An example

Reducing your greenhouse gas emissions by one tonne does not have to be difficult or expensive, or require major lifestyle changes. If you are a family of five living in Ontario, here is how you might reduce your greenhouse gas emissions by five tonnes (or one tonne per person), if you use natural gas for your home heating and drive an older full-sized vehicle.

What you can do	Reduced greenhouse gas emmisions (kg/year)
Seal and insulate forced air system ducts	1,100 kg
Lower the thermostat by 2 degrees C.	750 kg
Switch from the hot dry cycle to the energy savings cycle on the dishwasher	20 kg
Install a low flow showerhead	485 kg
Replace an old vehicle	2,580 kg
Use 10 litres of gas less a month by walking more often and carpooling one day a week	288 kg
Total	5,273 kg (over 5 tonnes)

source: Energy Council of Canada: Action By Canadians program

To find out more about what the Government of Canada is doing and what you can do,

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Climate change has the potential to have serious impacts on your health.

Regional differences in warming patterns, precipitation and extreme weather events mean that the health effects of climate change will vary according to where you live. Young children, the elderly, those in poor health, or those living in poor quality housing will be most vulnerable to stresses related to weather extremes.

Researchers in Canada are working together to learn more about the effects of climate change on our health. They will help us in finding ways to adapt to the impacts of climate change on communities, vulnerable individuals, and public health and emergency services.

Extreme temperature

Climate change will mean that we will experience shorter and milder winters. However, climate change scientists tell us that over the coming century we can expect heat waves during summer months to:

- Occur more frequently
- Be hotter
- Last longer
- Have higher levels of humidity

More intense heat waves may cause an increase in heat-related illnesses (heat stroke and dehydration); respiratory and cardiovascular illness, physical and mental stress; and the spread of infections.

During the next 50 years, heat-related deaths may increase, particularly in large cities in southern Canada, unless adequate measures are taken to protect vulnerable populations and to reduce the urban heat island effect. (This effect occurs when natural vegetation is replaced by surfaces

that absorb heat, such as building roofs and walls, and pavement.) The City of Toronto has already begun to protect vulnerable people during heat waves, and to take measures to reduce the heat buildup within the city.

Air quality

Warmer temperatures and prolonged heat waves will bring an increase in air pollution, particularly in urban and industrialized areas. Ground-level ozone, the primary ingredient of smog, results when sunlight and heat interact with pollutants such as nitrogen oxides and volatile organic compounds. These pollutants are released by the burning of fossil fuels. As temperatures go up, we will have more smoggy days.

Asthma and other respiratory problems are already on the rise; warmer temperatures with increased humidity and air pollution may cause them to increase further.

Health



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Children are especially vulnerable to air pollution because of their smaller size, the fact that their lungs are still developing, and because they spend more time being active outdoors than adults. Hotter, more humid weather could pose special health risks for children who already suffer from asthma. Changes in wind and weather patterns can also change the amount of fungi and molds in the air, affecting people with allergies.

Extreme Weather Events

A warmer climate is likely to cause more frequent and more intense severe weather events, such as hurricanes, tornadoes, thunderstorms, floods and droughts. These events have many potential health impacts, including direct physical injury or death, as well as psychological distress due to the loss or injury of loved ones and property, mass evacuations, and moving into shelters.

Although it is not possible to link recent severe weather events directly to climate change, examples in the past suggest the types of risks to health and

well-being that Canadians may face in the future. The Red River flood in May 1997 caused the evacuation of more than 29,000 people in Southern Manitoba, and resulted in \$815 million in damages. The eastern Ontario, southern Quebec and New Brunswick ice storm in January 1998 resulted in massive power outages affecting 4.7 million people. More than 600,000 people had to be evacuated and there were 28 deaths and 945 injuries. Total damages were estimated to be \$5.4 billion.

Water quantity and quality

A more extreme climate could affect the quality and quantity of our water. Lower flows of water in lakes and rivers caused by heat waves and droughts can lead to poor water quality and to an increase in waterborne diseases. Surface water can also be contaminated during heavy storms and floods by storm sewer overflows.

Hot weather can cause microorganisms to grow and cause outbreaks at recreational beaches and in shellfish. It can also increase chances of food poisoning outbreaks.

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Economic Impact

How will implementing the Kyoto Protocol affect Canada's economy?

There will be costs to meeting the targets in the Kyoto protocol, but the Government of Canada is committed to working with provincial and territorial governments, business and industry to develop implementation strategies that ensure a strong and growing national economy. The Government wants to ensure that no province or region bears an unreasonable share of the burden, and that Canadian business remains competitive in the North American and global marketplace.

Sophisticated economic models were used to help guide the design of the plan. While this does not represent modeling of the final plan, the Government of Canada uses these models to fine-tune elements of the plan to even out the impacts on different regions and to reduce the impacts on different sectors of the economy. These models show that many of the negative impacts that had been predicted in earlier studies can be reduced through changes in the strategies used to encourage GhG reductions by governments, business and consumers.

The model is based on the economic scenario that the federal-provincial Analysis and Modeling Group agreed to use as a base case more than a year ago, and on the assumptions that the international price of carbon permits will be \$10 and that the Government of Canada's climate change initiatives and programs are directly absorbed within budget. Three other scenarios were also modeled using different assumptions for prudent risk management.

While it is impossible to be precise in forecasting over 8 to 10 years, the estimated economic impact for the most likely scenario is -0.4 percent of GDP. This is a modest impact relative to the strong economic growth expected over this period. Achieving the first 170 MT of Canada's 240 MT emissions reduction target is estimated to have the following impact on:

Employment

- By 2010, Canada's economy will generate about 1.26 million new jobs, roughly 60,000 fewer than we might expect otherwise.

Consumer energy prices

- There will be no direct impact on gasoline prices.
- The price of natural gas would rise by 4 to 8 percent over the next eight years.
- More efficient houses, cars and equipment will reduce overall energy costs.

Key sectors of our economy

- As you read this section, keep in mind all sectors of our economy will continue to grow over the next eight years. These numbers describe how much bigger or



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smaller than growth will be after those eight years as a result of our climate change actions. So, when it says "0.2 percent less growth," it doesn't mean that part of our economy will get smaller over the next eight years, it means it just won't grow quite as much.

Auto industry	+0.9 percent
Iron and steel	+0.4 percent
Oil and gas	-0.4 percent
Electricity	-2.8 percent
Metal mining	-0.2 percent
Pulp and paper	+0.2 percent
Agriculture	-0.8 percent
Consumer goods/services	-0.1 percent
Communications	+0.2 percent

Overall economic growth

Canada's Gross Domestic Product (GDP) will grow by about 17.5 percent as we take action on climate change over the next eight years. That's about 0.4 percent less growth than we might expect otherwise.

Economic growth for individual provinces

- Impacts on provincial and territorial economic growth over the next eight years would be marginal, and fairly evenly distributed. Again, a negative number does not mean a province's

economy is going to shrink, it means that province's economy will grow by that much less than expected between now and 2010.

Newfoundland	-0.2
Prince Edward Island	-0.4
Nova Scotia	-0.3
New Brunswick	-0.2
Quebec	-0.2
Ontario	+0.2
Manitoba	-0.2
Saskatchewan	-0.4
Alberta	-0.4
British Columbia	-0.5
The Territories	0.0

Other impacts

This economic modeling does not take into account the positive impacts of taking action on climate change. For example, the benefits of cleaner air on Canadians' health, the beneficial effects on our environment in general and the opportunities flowing from accelerated innovation.

For more detailed modelling results on the economic impact to key sectors of our economy and for individual provinces, please visit Modelling the economic impacts of addressing Climate Change: www.climatechange.gc.ca/english/ecoimpact/toc.html

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Additional Benefits



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The Additional Benefits of Taking Action

Climate change could have a profound impact on the Canadian way of life. No region of the country, and indeed no region of the globe, can escape the far-reaching effects of global climate change, from more frequent and severe weather events to rising sea levels.

As we contemplate the potential impacts, it is important to remember the same emissions that contribute to climate change – burning fossil fuels, industrial emissions – bring about a number of other negative environmental impacts.

By ratifying the Kyoto Protocol, Canada's primary goal is to reduce its greenhouse gas emissions by 6 percent below 1990 levels over the period 2008-2012, and thus contribute to the international effort to reduce the rate and intensity of climate change. But other important benefits will be gained from our actions to fight climate change. The actions Canada undertakes now to address climate change will make a positive contribution to our quality of life for generations to come both in terms of lessening the impact of climate change, and in providing cleaner, healthier communities for all Canadians.

Air Quality

Burning fossil fuel is an important factor in climate change and also affects our environment and our quality of life by contributing to smog, acid rain and toxic substances to the atmosphere.

Smog events are likely to become both more frequent and longer lasting. Warmer temperatures brought about by climate change provide the conditions that allow this type of pollution to form and cause more damage to human health.

A number of hazardous air pollutants like mercury, benzene and black carbon, (or soot) result from the burning of fossil fuels and industrial processes. They remain

present in the environment for long periods of time. Mercury from coal-fired power plants also accumulates in the body tissues of animals and humans, leading to significant health consequences.

Reducing our use of fossil fuels by 10 percent will reduce the presence of these pollutants in the air by 5.5 percent. As well, a reduction of 10 percent in overall fossil fuel use will result in a 5.5 percent reduction in sulphur dioxide and a 9 percent reduction of nitrogen oxides. Improving air quality is an important additional benefit of fighting climate change. It is related to every moment of our lives – the air we breathe – with direct impacts on our health.



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Natural Resources

Actions to reduce the emission and effects of greenhouse gases (GHG) will have significant impacts on the quality and quantity of water resources, as well as ecosystems.

Changes in forestry practices and reforestation programs will reduce emissions and add to our capacity to "store" carbon from the atmosphere and offset existing GHG emissions, as well as benefits in the maintenance of habitat and biodiversity.

Significant changes in climate variability will likely affect different regions of Canada in different ways. In some parts of the country, this could mean longer and more frequent droughts, while other areas may experience wetter conditions.

Lakes and forests have suffered and are still recovering from damage from acid rain. Action on climate change will further reduce acid rain, helping in the recovery of aquatic and terrestrial ecosystems in Canada. As well, any measures that result in a reduction of our reliance on fossil fuel will also reduce the risks to wildlife from mercury and other related contaminants into the air.

Innovation and Technology

GHG concentrations in the environment will continue to increase with the technologies currently in use. But new, more efficient technologies have

the potential to contribute to Canada's ability to meet its Kyoto targets. The Plan proposes a national goal – for Canadians to become the most sophisticated and efficient consumers of energy in the world, and leaders in the development of new, cleaner technologies. These new technologies will help reduce our GHG emissions, as well as a wide range of other atmospheric pollutants. They will also have a positive impact on releases to water and waste streams, with the related economic and health implications.

There is no single technological solution to achieve the scale of GHG emissions reductions needed to adequately address climate change. We need to use all possible low-emitting and energy efficient technologies, and apply them to all sectors of our economy, including power generation, transportation, industry, building design and operations, and our individual practices and habits. Added to the environmental benefits associated with these new technologies are the economic opportunities for Canada in an expanding global market for clean energy solutions.

Meeting our global responsibilities to reduce greenhouse gas emissions is a challenge that will require the effort and commitment of all Canadians and all Canadians will share in the benefits.

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Large Industrial Emitters

Ensuring the Competitiveness of Canada's Large Industrial Emitters

The large industrial emitters are in three main sectors: thermal electricity generation, oil and gas, and mining and manufacturing.

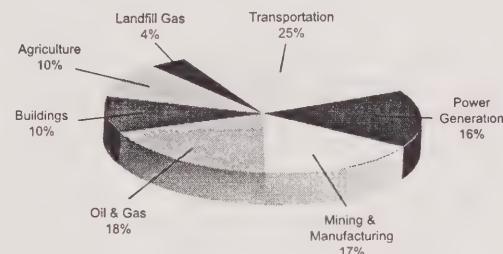
As the chart indicates, these sectors are forecast to contribute almost 50 percent of the Canadian emissions by 2010. The Climate Change Plan for Canada proposes a three pronged approach to the large industrial emitters:

- targets for emissions reductions established through covenants with a regulatory or financial backstop;
- access to emissions trading to provide flexibility; and
- complementary measures, including cost-shared investments in innovative technologies.

The Government of Canada will seek to design measures that are effective in encouraging lower emissions, and that maintain the competitiveness of Canadian industry.

The approach would provide incentives to reduce emissions. It would not place an absolute cap on industry's or any firm's emissions, as permits would increase with output and additional permits could be purchased.

Industry has expressed interest in covenants as an approach that may lend itself more readily to dealing with individual sector circumstances. Covenants are binding agreements that could include emissions intensity undertakings, and other undertakings such as technology



development, investments in emissions reductions, partnership activities or other steps to reduce emissions.

Alberta suggests in its plan that sector agreements could be backstopped by regulation or financial consequences for non-participation. Whatever the approach finally determined, the Government of Canada believes that enforceable covenants with a regulatory or financial backstop should be a central element of the Canadian strategy to reduce industrial emissions.



Other issues

Industry has a particular concern about the extent of its risk exposure. The Government recognizes the need for clarity and agrees that the target will not be more than 55 MT. Any amounts beyond that target would be achieved through incentives.

The Government of Canada is similarly prepared to work with industry to provide protection against risks associated with sustained high international prices for carbon emission permits.

Finally, in 2000, federal and provincial ministers of energy and the environment endorsed the principle that companies that take early action should not be

disadvantaged by an output based emissions regime. The Government will continue to work with industry to design a system that will not disadvantage those firms that have taken early action.

Discussions will continue with provincial and territorial governments and at the sectoral level with the intention of arriving at a general approach to industrial emissions in the early months of 2003. It is expected that the details of the system will then be developed in the 2003-2004 period.

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Climate Change in British Columbia

There is broad scientific consensus on the reality of climate change. It is happening, and it has serious implications – for our health, our economy, and our future.

Human activities, including the heavy use of fossil fuels for heating, transportation and electricity, release greenhouse gases that are accumulating and causing global warming. Average global temperatures are rising – the 20th century was the warmest the world has seen in 1,000 years, and the 1980s and 1990s were the warmest decades on record. As a northern country, Canada will feel the impacts of climate change more than most countries.

In British Columbia, average annual temperatures warmed during the 20th century by 0.6°C on the coast, 1.1°C in the interior, and 1.7°C in the north. Average spring and nighttime temperatures are now warmer than they were 100 years ago. Precipitation increased by 2 to 4 percent per decade in southern British Columbia. Climate models project that the greenhouse gases already in the atmosphere will continue to drive climate change for centuries to come. By the end of the 21st century, average temperatures in British Columbia will likely be 1°C to 4°C warmer, depending on the region, than they are now.

Changes of this magnitude can have significant impacts on ecosystems and quality of life.

Bodies of Water

Glaciers in southern British Columbia retreated during the 20th century. Lakes and rivers now become free of ice earlier in the spring, and the Fraser River is discharging more water earlier in the year. These trends point to lower summer flows in some streams and rivers, and less water for agriculture, hydroelectric power generation, industry and communities. This may pose significant problems in drier regions such as the Okanagan, where water is already in short supply.

Fisheries

The average summer temperature of the Fraser River increased by 1.1°C over the past 50 years. A warmer climate may pose

problems for salmon as they migrate upriver to spawn. Salmon are sensitive to temperature; warmer water can deplete their energy reserves, and make them more vulnerable to stress, infection, and disease.

If summer river temperatures continue to rise, fewer fish may make it successfully upriver to their spawning grounds, and some salmon populations may be at risk.

The air we breathe

A number of B.C. cities, including Nelson, Penticton, Prince George, Vancouver, and Williams Lake, lie within valleys that trap polluted air. Airborne pollutants worsen asthma, impair lung function and can even cause death. In the Lower Mainland, if summers become warmer, "bad air days"



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and their related health costs will likely increase. In the interior, if winters become warmer, and residents use less wood fuel for heating, air quality may improve.

Seas

Sea levels rose along most of the BC coast during the 20th century. Higher sea levels increase the risk of flooding in low-lying coastal areas. They may inundate wetlands, beaches, dunes, and other sensitive coastal ecosystems, and threaten Aboriginal heritage sites. They may also create drainage problems and overwhelm municipal sewage systems. Low lying agricultural lands may become too saline

for cultivation. Waterfront homes, wharves, roads and port facilities may be at risk during severe storms.

Forests

In summer, warmer temperatures may promote increased evaporation, and loss of soil moisture. Grasslands may replace forest in areas that become too dry for trees. Higher temperatures and drier summer conditions may increase the frequency of forest fires. Forest disease and pest infestations may also increase as warmer summers place additional stress on trees, and warmer winters increase pest survival.

Taking Action

Given the potentially serious and long-term nature of the risks associated with these impacts, the only prudent course is to take action now to reduce the emissions that contribute to climate change. Analysis shows that the impact on Canadian jobs and economic growth associated with reducing greenhouse gas reductions can be kept modest and manageable relative to the strong growth expected over the next decade.

To give a sense of the possible order of magnitude of the impacts on industry, the estimated economic impact of implementing steps one and two in the Climate Change Plan for Canada to meet Canada's Kyoto commitments ranges from -0.4 percent to -1.6 percent of Canada's gross domestic product, dependent on various assumptions.

This is a modest impact relative to the strong economic growth expected over this period. Analysis shows job growth of 1.08 to almost 1.26 million jobs by 2010, compared to just over 1.32 million in a business as usual scenario. That means a delay in job creation of about 62,000 jobs across Canada in the year 2010. By comparison, the Canadian economy is currently creating new jobs at a rate of about 46,000 per month.

Estimates indicate that with the implementation of actions to reduce greenhouse gas emissions, British Columbia's provincial gross domestic product in the year 2010 would grow to a level that would be about 0.53 percent less than in a business as usual scenario. Growth in new jobs would slow by approximately 0.6 percent, or a delay in job creation over the next eight years of about 12,700 new jobs. To put this into context, British Columbia's economy created approximately 81,200 jobs over the past year. In view

of its strength in industrial sectors such as fuel cell technologies, and its strong resource base in hydro-electricity and natural gas, BC stands to benefit from efforts to move to a less GHG-intensive economy.

These economic forecasts do not reflect the significant environmental and health benefits to be gained by addressing climate change. Taking action will provide broader benefits including cleaner air, reduced health costs and other environmental and social benefits for Canadians.

The impact on personal disposable income by 2010 would be approximately 0.22 percent less than business as usual. Relative to what they would otherwise be, electricity prices could drop by approximately 0.45 cents/KWh. Gasoline prices are expected to remain at their business as usual level in 2010.

An illustrative example of production increases for major industrial emitters in the province as a result of measures to reduce greenhouse gases (national averages) is as follows:

- **pulp and paper** would rise by 0.06 percent, about 59 cents per tonne
- **natural gas** would rise by 0.5 cents/million cubic feet, or 0.14 percent

- **electricity – gas** would rise by 0.04 cents per KWH or 0.60 percent
- **Aluminium** would rise by \$4.73 per tonne or by 0.23 percent

Canada's approach to reducing greenhouse gas emissions is designed to minimize costs and maximize opportunities for Canadian technology. It envisions an economy that is based on cleaner sources of energy, using leading edge technologies. The Plan proposes strategic investments in innovative climate change proposals and the creation of a

Partnership Fund that will cost-share emission reductions in collaboration with provincial and territorial governments as well as municipalities, Aboriginal communities and the private sector.

By drawing on Canadian innovation, and by ensuring that different sectors of the economy, regions and consumers play a role in taking action on climate change, the impact is more manageable for all. Working together, Canada can position itself as a strong competitor as the world moves to a new, less carbon-intensive economy.

British Columbia-based companies are already showing leadership in meeting the challenges of climate change¹:

- Westcoast Energy introduced economic incentives and programs among business and industrial sectors to promote high-efficiency water heaters and boiler efficiency workshops. Through the use of a special compound coating inside pipelines, Westcoast Energy has helped reduce friction losses in the transportation of natural gas. In addition to reducing the amount of power required to move natural gas, the technique has already reduced greenhouse gas emissions by 9,600 tonnes. In 2000, total GHG emission reduction attributable to these programs was calculated at 246,000 tonnes per year.
- Canfor Corporation met its commitment to stabilize GHG emissions from fossil fuels to below 1990 levels by 2000, and predicts that it further reduce emissions to 6 percent of its 1990 levels before the 2008-2012 timeframe.
- Riverside Forest Products Limited, Canada's largest producer of softwood, plywood and

veneer, participated in an energy performance contracting pilot project at its plywood plant in Armstrong. Co-funded by the Canadian Industry Program for Energy Conservation (CIPEC) and the BC Hydro "Power Smart Services Program", the pilot study found that some system motors were operating at only 27 to 50 percent efficiency, many fans were inefficient and air pressure was sometimes higher than necessary. Modifications to correct these flaws reduced annual electricity consumption and saved the company \$98,200.

- The development of Ballard Power Systems Inc.'s revolutionary hydrogen fuel cell, a breakthrough clean energy technology, is an excellent example of Canadian innovation to address climate change. Ballard Power Systems Inc. has received Government of Canada support since shortly after the company first began developing the hydrogen fuel cell. Now the Government of Canada is a part of a joint venture with Ballard, DaimlerChrysler and Ford Motor Company to develop fuel cells for passenger vehicles.

¹ Examples are taken from the public record.

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Climate Change in Alberta

There is broad scientific consensus on the reality of climate change. It is happening, and it has serious implications—for our health, our economy, and our future.

Human activities, including the heavy use of fossil fuels for heating, transportation and electricity, release greenhouse gases that are accumulating and causing global warming. Average global temperatures are rising—the 20th century was the warmest the world has seen in 1,000 years, and the 1980s and 1990s were the warmest decades on record. As a northern country, Canada will feel the impacts of climate change more than most countries.

The Prairies are likely to experience increased temperatures with climate change. Recent models suggest that summer temperatures in Alberta could warm by 3 to 5°C by 2080. Such changes would be the largest and most rapid of the last 10,000 years and would have impacts on ecosystems and quality of life.

Rivers, glaciers and water demand

Alberta is seeing rapid industrial, agricultural and municipal growth, which is putting more pressures on existing water supplies and potentially affecting the quality of surface water and groundwater.

The risk of flooding is expected to increase in the small rivers of the interior Cordillera and on the southeastern slopes of the Rocky Mountains. With annual evaporation exceeding precipitation on the prairies, water supply is dependent on snowmelt runoff from the prairie and mountain regions to replenish lakes, reservoirs, wetlands and groundwater. Any alteration to the critical balance of this cycle could have a significant impact. Climate change may, for example, affect the timing of runoff and precipitation, the form or amount of precipitation, or the amount of evaporation. Over time, flows may decrease in the Bow and the North

Saskatchewan Rivers during the late summer and fall months. This could cause water shortages in communities that depend on rivers for their water supply.

Climate change could result in the significant retreat of large glaciers, such as the Athabasca glacier. Over the last century, drastic reductions in the surface area of glaciers have resulted in reduced downstream water flows. Glacial melt waters are necessary to maintain water levels, and to sustain the habitat that enables trout to migrate and spawn in the late summer and autumn in the Bow River. Reduced flows from glaciers may already be having a serious impact on the Bull Trout. The Alberta hydroelectric industry would also be affected by lower water flows.

Urban centres

Nearly 60 percent of Albertans, almost 2 million people, live in either Calgary or

Alberta



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Edmonton, and the area around Calgary is the fastest growing region in the Prairies. Climate change is expected

to affect life in the city in several different ways. Warmer summers are expected to increase the number of very hot days, decrease air quality, and increase energy demands, due to greater air conditioner usage. On the other hand, warmer, shorter winters mean that heating demands would decline and the need for snow removal would be reduced.

In the summer, campers and hikers could enjoy a longer season. However, water-based activities, such as boating and fishing, could be negatively affected. People who enjoy winter activities would find their season shortened.

Forests and grasslands

In a warmer climate, the boreal forest, aspen parkland and open grassland; may shift northward.

Some scientists predict that much of the boreal forest in the province will be replaced by aspen parkland. Similarly, large regions of aspen parkland are expected to become grasslands. In the northern regions, forest growth may benefit from warmer temperatures and longer growing seasons. However, forest fires and insect outbreaks are expected to increase throughout the province.

Changing weather patterns

Extreme events, such as thunderstorms, tornadoes, hailstorms, and heat waves, may become more common on the Prairies due to climate change. Warmer winters may increase the likelihood of both intense winter storms and rainstorms. In the summer, local flooding may increase as rains become more intense. The pattern of other weather conditions, such as droughts, may also change.

Taking Action

Given the potentially serious and long-term nature of the risks associated with these impacts, the only prudent course is to take action now to reduce the emissions that contribute to climate change. Analysis shows that the impact on Canadian jobs and economic growth associated with reducing greenhouse gas reductions can be kept modest and manageable relative to the strong growth expected over the next decade.

To give a sense of the possible order of magnitude of the impacts on industry, the estimated economic impact of implementing steps one and two in the Climate Change Plan for Canada to meet Canada's Kyoto commitments ranges from -0.4 percent to -1.6 percent of Canada's gross domestic product, dependent on various assumptions.

This is a modest impact relative to the strong economic growth expected over this period. Analysis shows job growth of 1.08 to almost 1.26 million jobs by 2010, compared to just over 1.32 million in a business as usual scenario. That means a delay in job creation of about 62,000 jobs across Canada in the year 2010. By comparison, the Canadian economy is currently creating new jobs at a rate of about 46,000 per month.

Estimates indicate that with the implementation of actions to reduce greenhouse gas emissions, Alberta's provincial gross domestic product in the year 2010 would grow to a level that would be about 0.39 percent less than in a business as usual scenario. Growth in new jobs would slow by approximately

0.4 percent, or a delay in job creation over the next eight years of about 5,900 new jobs. To put this into context, Alberta's economy created approximately 42,400 jobs over the past year.

These economic forecasts do not reflect the significant environmental and health benefits to be gained by addressing climate change. Taking action will provide broader benefits including cleaner air, reduced health costs and other environmental and social benefits for Canadians.

The impact on personal disposable income by 2010 would be approximately 0.05 percent less than business as usual. Relative to what they would otherwise be, electricity prices could drop by approximately 0.32 cents/KWh. Gasoline prices are expected to remain at their business as usual level in 2010.

An illustrative example of production increases for major industrial emitters in the province as a result of measures to reduce greenhouse gases (national averages) is as follows:

- conventional oil would rise by 3 cents per barrel,

- **heavy crude oil** would rise by 1.5 cents per barrel, or by 0.05 percent
- **natural gas** would rise by 0.5 cents per million cubic feet, or 0.14 percent
- **pipelines** would rise by 0.14 cents per million cubic feet
- **oil sands – bitumen** would rise by 10 cents per barrel, or 0.34 percent
- **oil sands – synthetic** would rise by 12 cents per barrel, or by 0.31 percent
- **electricity – coal** would rise by 0.14 cents per KWH, or by 1.94 percent
- **electricity – gas** would rise by 0.04 cents per KWH or 0.60 percent

Canada's approach to reducing greenhouse gas emissions is designed to minimize costs and maximize opportunities for Canadian technology. It envisions an economy that is based on cleaner sources of energy, using leading edge technologies. The Plan proposes strategic investments in innovative climate change proposals and the creation of a Partnership Fund that will cost-share well as municipalities, Aboriginal communities and the private sector.

By drawing on Canadian innovation, and by ensuring that different sectors of the economy, regions and consumers play a role in taking action on climate change, the impact is more manageable for all. Working together, Canada can position itself as a strong competitor as the world moves to a new, less carbon-intensive economy.

Alberta-based companies and communities are already showing leadership in meeting the challenges of climate change¹:

- Shell Canada met its target to reduce emissions to 1990 levels by the end of 2000. The company plans to further reduce GHG emissions to six percent below 1990 levels in the period 2001 to 2008.
- TransAlta has reduced its Canadian net carbon dioxide emissions by 18 percent (nearly 5 million tonnes annually) since 1990, and has tabled an aggressive plan to reduce its Canadian net carbon dioxide emissions from existing operations to zero by 2024.
- Other Alberta companies, including Vision Quest Inc, Enmax Corporation and the City of Calgary, are leaders in developing and promoting wind-generated, environmentally friendly power.
- Syncrude Canada Ltd. is the world's largest producer of crude oil from oil sands and it is

one of Canada's leading energy companies when it comes to putting energy efficiency to work. From 1988 to the end of 1999, Syncrude cut carbon dioxide emissions per barrel of oil produced by 26 percent, and it estimates that by 2008 the total reduction will improve to 42 percent.

- At its Joffre, Alberta, plant, NOVA Chemicals' new cogeneration power plant, which produces electricity and usable heat at the same time, is now in operation. The \$380-million plant generates enough power to supply all of the newly expanded plant's electricity and steam needs. In addition, the power plant adds more than four percent to the amount of electricity generated in Alberta by selling excess power to the Alberta Interconnected System, the area's electricity provider. This move not only saves on operating costs, but also reduces the number of greenhouse gas emissions.

¹ Examples are taken from the public record.

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percent less than in a business as usual scenario.
Growth in new jobs would slow by approximately

- **conventional oil** would rise by 3 cents per barrel,

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Climate Change in Ontario

There is broad scientific consensus on the reality of climate change. It is happening, and it has serious implications – for our health, our economy, and our future.

Human activities, including the heavy use of fossil fuels for heating, transportation and electricity, release greenhouse gases that are accumulating and causing global warming. Average global temperatures are rising – the 20th century was the warmest the world has seen in 1,000 years, and the 1980s and 1990s were the warmest decades on record. As a northern country, Canada will feel the impacts of climate change more than most countries.

Scientists estimate that Ontario will warm an average of 2°C to 5°C within the next 75 to 100 years. The winter months are projected to warm faster than the summer months, and extreme events, such as floods, droughts, and storms will likely become more common and severe. These changes will have severe consequences for our lives and the ecosystems that support us.

Health

Global climate models suggest that over the next 50 years, heat waves will increase in frequency, intensity, and duration in southern Ontario. There are likely to be as many as 30 days over 30 Celsius each summer, instead of the current average of 10 days. An increase in very hot days (over 35°C) could increase the risk of heat stress related health problems, especially in the very old, the very young, and those with chronic lung diseases, such as asthma. Higher temperatures would increase the number of "bad air days". A warmer climate and longer frost-free seasons may also permit the spread of diseases such as Lyme disease.

experts predict that extremely hot days, severe thunderstorms, and freezing rain events will all increase in frequency due to climate change. Extreme weather events such as these have been shown to increase deaths, injuries, and stress-related disorders. However, it is also likely that the number of extremely cold days will decrease, which could have an impact on cold weather mortality rates.

The Great Lakes

Global climate models project that by 2050, lake levels will be lower than they are now, perhaps by more than one metre. Models also suggest a smaller and earlier spring runoff. This will impact:

- **Hydroelectricity:** Lower water levels and flows will result in less hydropower production.

Ontario



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- **Recreational boating:** Lower water levels create problems for cottagers, marine operators, and for launching, hauling out, and boat operation in shallow areas.
- **Water supply:** Higher water temperatures reduce water quality by creating a more favourable environment for microbes and algae blooms, while lower water levels can affect the ability of intakes to draw water.
- **The environment:** Shoreline wetlands and other critical habitats may suffer from extended periods of low lake levels.

Agriculture

Warmer temperatures and earlier and longer frost-free periods (longer by as much as five weeks) will extend the grazing season and increase the potential yield of warmer weather crops such as corn, soybeans, and tomatoes. It is also possible that farmers may cultivate these crops farther north,

depending on the suitability of the soil and the frequency and severity of droughts. In southern Ontario, the potential for growing specialty fruits and vegetables may increase.

However, less rainfall at different times could increase the need for irrigation in southwestern Ontario, particularly on drought-prone soils, and for shallow-rooted crops, such as potatoes. In some areas, milder winters and less consistent snow cover are likely to increase injury damage to over-wintering crops.

Forests

Forests will suffer from greater stress due to drought, and more frequent and extreme storms, wind damage, fires, and insect outbreaks. However, where drought is not a limiting factor, marginal soils may become more productive, as warmer temperatures cause plant debris under trees to decompose and add nutrients to the soil more quickly.

Taking Action

Given the potentially serious and long-term nature of the risks associated with these impacts, the only prudent course is to take action now to reduce the emissions that contribute to climate change. Analysis shows that the impact on Canadian jobs and economic growth associated with reducing greenhouse gas reductions can be kept modest and manageable relative to the strong growth expected over the next decade.

To give a sense of the possible order of magnitude of the impacts on industry, the estimated economic impact of implementing steps one and two in the Climate Change Plan for Canada to meet Canada's Kyoto commitments ranges from -0.4 percent to -1.6 percent of Canada's gross domestic product, dependent on various assumptions.

This is a modest impact relative to the strong economic growth expected over this period. Analysis shows job growth of 1.08 to almost 1.26 million jobs by 2010, compared to just over 1.32 million in a business as usual scenario. That means a delay in job creation of about 62,000 jobs across Canada in the year 2010. By comparison, the Canadian economy is currently creating new jobs at a rate of about 46,000 per month.

Estimates indicate that with the implementation of actions to reduce greenhouse gas emissions, Ontario's provincial gross domestic product in the year 2010 would grow to a level that would be about 0.17 percent higher than in a business as usual scenario. Growth in new jobs would slow by approximately 0.3 percent, or a delay in job creation over the next eight years of about 18,200 new jobs. To put this into context, Ontario's economy created approximately 183,600 jobs over the past year.

The modeling suggests that Ontario manufacturing and automobile industries will likely benefit from the move to a more energy efficient society as demand increases for new investments, technology and equipment to help implement the Canadian climate change plan.

Under the plan, the production cost of energy and raw materials such as steel and aluminum required for manufacturing, would rise only slightly, and the cost of gasoline, which is so important for the distribution and export of manufactured goods, would not rise beyond business as usual levels. Indeed, the modeling suggests that investments and activities to meet the first two steps of the plan would lead to a slight increase in provincial gross domestic product compared to business as usual forecasts.

These economic forecasts do not reflect the significant environmental and health benefits of addressing climate change. Taking action will provide broader benefits including cleaner air, reduced health costs and other environmental and social benefits for Canadians.

The impact on personal disposable income by 2010 would be approximately 0.08 percent higher than business as usual. Relative to what they would otherwise be, electricity prices could drop by about 0.18 cents/KWh. Gasoline prices are expected to remain at their business-as-usual level in 2010.

An illustrative example of production increases for major industrial emitters in the province as a result of measures to reduce greenhouse gases (national averages) is as follows:

- **conventional oil** would rise by 3 cents per barrel, or by 0.09 percent
- **natural gas** would rise by 0.5 cents/million cubic feet, or 0.14 percent
- **electricity – coal** would rise by 0.14 cents per KWH, or by 1.94 percent
- **electricity – gas** would rise by 0.04 cents per KWH or 0.60 percent
- **steel – conventional** would rise by 0.29 percent, about \$2.10 per tonne
- **steel – electric arc** would rise by 0.08 percent, or 60 cents per tonne

- **aluminum** would rise by 0.23 percent, or \$4.73 per tonne

Canada's approach to reducing greenhouse gas emissions is designed to minimize costs and maximize opportunities for Canadian technology. It envisions an economy that is based on cleaner sources of energy, using leading edge technologies. The Plan proposes strategic investments in innovative climate change proposals and the creation of a Partnership Fund that will cost-share emission reductions in collaboration with provincial and territorial governments as well as municipalities, Aboriginal communities and the private sector.

By drawing on Canadian innovation, and by ensuring that different sectors of the economy, regions and consumers play a role in taking action on climate change, the impact is more manageable for all. Working together, Canada can position itself as a strong competitor as the world moves to a new, less carbon-intensive economy.

Ontario-based companies and communities are already showing leadership in meeting the challenges of climate change¹:

- Iogen Corporation is a specialty chemical manufacturer that is the world's leading developer of ethanol-from-cellulose, a clean transportation fuel. In co-operation with Petro-Canada and the Government of Canada, Iogen is developing and demonstrating a cost-effective process for the production of ethanol from biomass, including existing agricultural waste and dedicated crops such as switchgrass. Iogen expects to produce ethanol at a lower cost than the corn-based ethanol and anticipates this technology will lead to the widespread use of 10 percent ethanol, blended with gasoline, as a motor vehicle fuel in Canada.
 - The Toronto Better Buildings Partnership is proving that municipal governments can undertake major building retrofits to improve energy efficiency and achieve cost savings, while simultaneously realizing large reductions in greenhouse gas emissions. The program reduced the city's annual greenhouse gas
- emissions by 110,000 tonnes per year during the first four years of operation, while cutting annual building operating costs by \$11.8 million and creating 3,000 person-years of employment.
- IBM Canada reduced energy use at Canadian facilities by 36 percent between 1990–1998, leading to a 32 percent decrease in carbon dioxide emissions.
 - With ongoing Government of Canada support, Conserval Engineering Inc. developed the Solarwall™, the world's most efficient solar heating system. In recent years, companies such as Bombardier, General Motors and the Ford Motor Company have purchased solarwalls to retrofit their complexes.
 - Sudbury Ontario and Toromont Energy Ltd. developed a district-energy system that uses a central plant to meet the energy needs of a cluster of buildings, eliminating their need for individual building based furnaces, air-conditioning units and boilers. The system is an environmentally friendly, cost-effective approach to providing energy.

¹ Examples are taken from the public record.

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Saskatchewan



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Climate Change in Saskatchewan

There is broad scientific consensus on the reality of climate change. It is happening, and it has serious implications—for our health, our economy, and our future.

Human activities, including the heavy use of fossil fuels for heating, transportation and electricity, release greenhouse gases that are accumulating and causing global warming. Average global temperatures are rising—the 20th century was the warmest the world has seen in 1,000 years, and the 1980s and 1990s were the warmest decades on record. As a northern country, Canada will feel the impacts of climate change more than most countries.

Most climate change projections for the Prairies show an increase in temperature under global warming. Recent models suggest that summer temperatures in Saskatchewan could warm by 3 to 5°C by 2080. Such changes would be the largest and most rapid of the last 10,000 years and would have profound effects on our lives and on ecosystems.

Life in the country

Nearly half of the population of Saskatchewan lives in rural areas, and agriculture is an important industry in the province. Climate change may threaten farms by increasing the risk of drought, dust storms, and insect infestations. Farmers may need to irrigate their crops more, while changes in the growing season would affect the types of crops grown. On the positive side, warmer temperatures may increase productivity and allow farmers to grow crops farther north.

Rivers

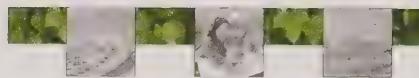
The impacts of climate change on Saskatchewan rivers will depend on each river's location and water source. Rivers that originate in the prairies will likely

experience lower and more variable flows. This means that although there will generally be less water available for use, the risk of larger extreme flows will increase. Riverside flooding in low-lying areas already affects many communities. In the Northern Plains, thawing permafrost would greatly increase the risk of damaging floods.

Water resources

The supply of water from Prairie streams is strongly affected by climate and varies from year to year. Longer and hotter summers will increase evaporation and reduce water levels in lakes and rivers. As a result, demands on groundwater could increase, making it even more important for Saskatchewan residents to use water resources wisely.

Canada



Forests and grasslands

In a warmer climate, boreal forest, aspen parkland and open grassland zones may shift northward. This means that much of the boreal forest may be replaced by aspen parkland, while large regions of aspen parkland may become grasslands. In the northern regions, forest growth may benefit from warmer temperatures and longer growing seasons but may be limited by unsuitable soil. Forest fires and insect outbreaks are expected to increase throughout the province. Damages to our forests from such events have been substantial in the past.

Weather patterns

Extreme events, such as severe thunderstorms, tornadoes, hailstorms, and heat waves, may become more common on the Prairies due to climate change. Warmer winters may mean more intense winter storms, and increase the likelihood of rain. In the summer, flooding may increase due to heavier rainfalls. Extreme weather conditions, such as droughts, may become more frequent.

Taking Action

Given the potentially serious and long-term nature of the risks associated with these impacts, the only prudent course is to take action now to reduce the emissions that contribute to climate change. Analysis shows that the impact on Canadian jobs and economic growth associated with reducing greenhouse gas reductions can be kept modest and manageable relative to the strong growth expected over the next decade.

To give a sense of the possible order of magnitude of the impacts on industry, the estimated economic impact of implementing steps one and two in the Climate Change Plan for Canada to meet Canada's Kyoto commitments ranges from -0.4 percent to -1.6 percent of Canada's gross domestic product, dependent on various assumptions.

This is a modest impact relative to the strong economic growth expected over this period. Analysis shows job growth of 1.08 to almost 1.26 million jobs by 2010, compared to just over 1.32 million in a business as usual scenario. That means a delay in job creation of about 62,000 jobs across Canada in the year 2010. By comparison, the Canadian economy is currently creating new jobs at a rate of about 46,000 per month.

Estimates indicate that with the implementation of actions to reduce greenhouse gas emissions, Saskatchewan's provincial gross domestic product in the year 2010 would grow to a level that would be about 0.39 percent less than in a business as usual scenario. Growth in new jobs would slow by approximately 0.3 percent, or a delay in job creation over the next eight years of about 1,500 new jobs. To put this into context, Saskatchewan's economy created approximately 5,520 jobs in the past year.

The impact on personal disposable income by 2010 would be approximately 0.05 percent less than business as usual. Electricity prices could drop by approximately 0.02 cents/KWh. Gasoline prices are expected to remain at their business as usual level in 2010.

An illustrative example of production increases for major industrial emitters in the province as a result of measures to reduce greenhouse gases (national averages) is as follows:

- **conventional oil** would rise by 3 cents per barrel, or by 0.09 percent
- **natural gas** would rise by 0.5 cents/million cubic feet, or 0.14 percent
- **electricity – coal** would rise by 0.14 cents per KWH, or by 1.94 percent
- **electricity – gas** would rise by 0.04 cents per KWH or 0.60 percent
- **steel – conventional** would rise by 0.29 percent, about \$2.10 per tonne
- **steel – electric arc** would rise by 0.08 percent, or 60 cents per tonne

These economic forecasts do not reflect the significant environmental and health benefits to be gained by addressing climate change. Taking action will provide broader benefits including cleaner air, reduced health costs and other environmental and social benefits for Canadians.

Canada's approach to reducing greenhouse gas emissions is designed to minimize costs and maximize opportunities for Canadian technology. It envisions an economy that is based on cleaner sources of energy, using leading edge technologies. The Plan proposes strategic investments in

innovative climate change proposals and the creation of a Partnership Fund that will cost-share well as municipalities, Aboriginal communities and the private sector.

By drawing on Canadian innovation, and by ensuring that different sectors of the economy, regions and consumers play a role in taking action on climate change, the impact is more manageable for all. Working together, Canada can position itself as a strong competitor as the world moves to a new, less carbon-intensive economy.

Saskatchewan-based companies are already showing leadership in meeting the challenges of climate change¹:

- IMC Potash Colonsay recently created a project team to look at energy consumption in its fluosolids drying process. The team found that better control of the airflow into the dryer offered major opportunities for reducing energy use. The results speak for themselves—by improving energy efficiency by 11 percent, natural gas and electricity use were substantially cut. The company estimates that this \$10,000 project will save it \$490,000 per year.
- The IEA Weyburn Carbon Dioxide Monitoring Project is examining the viability of using

carbon dioxide enhanced oil recovery techniques to permanently store carbon dioxide underground and simultaneously increase oil production. The injection of carbon dioxide into oil reservoirs located near large coal-fired power stations has significant potential to dispose of large quantities of carbon dioxide at relatively low cost.

- Saskatchewan participated in and managed the Greenhouse Gas Emission Reduction Trading Pilot (GERT), where organizations were able to buy and sell emission reductions on a trial basis gaining valuable practical experience with emission trading.

¹ Examples are taken from the public record.

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Climate Change in Manitoba

There is broad scientific consensus on the reality of climate change. It is happening, and it has serious implications—for our health, our economy, and our future.

Human activities, including the heavy use of fossil fuels for heating, transportation and electricity, release greenhouse gases that are accumulating and causing global warming. Average global temperatures are rising—the 20th century was the warmest the world has seen in 1,000 years, and the 1980s and 1990s were the warmest decades on record. As a northern country, Canada will feel the impacts of climate change more than most countries.

Most climate change projections for the Prairies show increased temperatures under global warming. Recent models suggest that summer temperatures in Manitoba could increase by 3 to 4°C, and winter temperatures by 5 to 8°C. Such changes would be the largest and most rapid of the last 10,000 years and would have profound effects on our lives and the ecosystems that support us.

Water

Increased spring volumes could also lead to higher levels of pollution, if land is flooded and manure and other storage facilities, such as municipal lagoons, are breached. If the spring water flows rapidly through to Hudson Bay, groundwater may not be recharged enough to fully replenish aquifers. Water quality in Manitoba might be in jeopardy because of the warmer temperatures and lower volumes of rivers and lakes in the summer. As the volume of surface water decreases, pollution levels increase. Increased summer temperatures, together with reduced precipitation and higher evaporation, might reduce the amount of water available for Manitoba's hydroelectric production.

Agriculture

More frost-free days will mean a longer growing season and a greater range of crops

available to producers. However, Manitoba farmers can expect to see declines in summer precipitation of 10 to 20 percent, creating a greater need for irrigation. As well, climate change could lead to increased heat stress on animals and plants. Warmer winters could reduce the amount of winter kill of fall-seeded crops, but could also reduce the winter kill of some weeds and insects, and lead to the introduction of new pests.

Weather patterns

Extreme events, such as thunderstorms, tornadoes, hailstorms, heat waves and droughts, may become more frequent on the Prairies due to climate change. Warmer winters may increase the potential for more intense winter storms, and more frequent rain. In the summer, flooding may increase with heavy rains.

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Forests

Manitoba's overall forest area is predicted to decrease as drier soil conditions in the south make forests more susceptible to wildfires and pests, and lack of suitable soil makes it difficult for southern species to grow in the north. As the climate changes, there will be fewer mature trees, and it will take longer for trees in the boreal forest to reach a harvestable age. Not only will this reduce the habitat of endangered species like the woodland caribou and grey fox, but it will also present challenges to the forest industry.

Polar bears on thin ice

In western Hudson Bay, ice break up is occurring two weeks earlier, on average, than it did 20 years ago. This shortens the time available for polar bears to

fatten up on their main food source, ringed seals, before going on shore where they fast. As a result, adult bears have been getting lighter and females, who fast until weaning their cubs the next spring, have been having fewer cubs.

Life in the north

Climate change will affect the traditional economies of Aboriginal peoples, including their ability to hunt and fish. Warmer air temperatures will thaw permafrost, creating unstable ground conditions and putting building foundations, roadways, railways, and pipelines at risk. Challenges are already being faced by communities dependent on winter roads for food, fuel and essential supplies.

Taking Action

Given the potentially serious and long-term nature of the risks associated with these impacts, the only prudent course is to take action now to reduce the emissions that contribute to climate change. Analysis shows that the impact on Canadian jobs and economic growth associated with reducing greenhouse gas reductions can be kept modest and manageable relative to the strong growth expected over the next decade.

To give a sense of the possible order of magnitude of the impacts on industry, the estimated economic impact of implementing steps one and two in the Climate Change Plan for Canada to meet Canada's Kyoto commitments ranges from -0.4 percent to -1.6 percent of Canada's gross domestic product, dependent on various assumptions.

This is a modest impact relative to the strong economic growth expected over this period. Analysis shows job growth of 1.08 to almost 1.26 million jobs by 2010, compared to just over 1.32 million in a business as usual scenario. That means a delay in job creation of about 62,000 jobs across Canada in the year 2010. By comparison, the Canadian economy is currently creating new jobs at a rate of about 46,000 per month.

Estimates indicate that with the implementation of actions to reduce greenhouse gas emissions, Manitoba's provincial gross domestic product in the year 2010 would grow to a level that would be about 0.24 percent less than in a business as usual scenario. Growth in new jobs would slow by approximately 0.1 percent, or a delay in job creation over the next eight years of about 900 new jobs.

To put this into context, Manitoba's economy created approximately 5,500 jobs over the past year.

These economic forecasts do not reflect the significant environmental and health benefits to be gained by addressing climate change. Taking action will provide broader benefits including cleaner air, reduced health costs and other environmental and social benefits for Canadians.

The impact on personal disposable income by 2010 would be approximately 0.11 percent less than business as usual. Relative to what they would otherwise be, electricity prices could drop by approximately 0.03 cents/KWh. Gasoline prices are expected to remain at their business as usual level in 2010.

An illustrative example of production increases for major industrial emitters in the province as a result of measures to reduce greenhouse gases (national averages) is as follows:

- **conventional oil** would rise by 3 cents per barrel, or by 0.09 percent
- **natural gas** would rise by 0.5 cents/million cubic feet, or 0.14 percent

- **electricity** – coal would rise by 0.14 cents per KWH, or by 1.94 percent
- **electricity** – gas would rise by 0.04 cents per KWH or 0.60 percent
- **pulp and paper** would rise by 0.06 percent, about 59 cents per tonne

Canada's approach to reducing greenhouse gas emissions is designed to minimize costs and maximize opportunities for Canadian technology. It envisions an economy that is based on cleaner sources of energy, using leading edge technologies. The Plan proposes strategic investments in

innovative climate change proposals and the creation of a Partnership Fund that will cost-share well as municipalities, Aboriginal communities and the private sector.

By drawing on Canadian innovation, and by ensuring that different sectors of the economy, regions and consumers play a role in taking action on climate change, the impact is more manageable for all. Working together, Canada can position itself as a strong competitor as the world moves to a new, less carbon-intensive economy.

Manitoba-based companies and communities are already showing leadership in meeting the challenges of climate change¹:

- At its plant in Carberry, Manitoba, Midwest Food Products Inc. took a hard look at energy use. As a result, the electrical system was upgraded and other energy efficiency improvements were made. Energy costs were reduced by more than \$900,000 in 1999 and \$400,000 in 2000, and carbon dioxide emissions were reduced by about 10,000 tonnes per year.
- Simmons Canada Inc. has launched energy-efficiency initiatives at its plants in Winnipeg, Manitoba and Brampton, Ontario. Upgrades to the lighting and heating systems at the Winnipeg plant and upgrades to Brampton's tempering ovens helped the company achieve a 12.45-percent reduction in natural gas use and a 7.28-percent decrease in electrical consumption.

- Maple Leaf Consumer Food has recently installed heat-recovery and vent-condensing systems at its Winnipeg, Manitoba plant, saving the company more than \$32,000 each year on fuel, water and boiler chemicals.
- Since 1995, an energy management team at Hudson Bay Mining and Smelting Company Ltd. has been responsible for achieving sustainable savings of about \$1 million per year at its Flin Flon, Manitoba operations. The savings are the result of various process improvements and a more efficient use of energy as recommended by a team of employees from all areas of surface and underground operations.

¹ Examples are taken from the public record.

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Climate Change in Quebec

There is broad scientific consensus on the reality of climate change. It is happening, and it has serious implications—for our health, our economy, and our future.

Human activities, including the heavy use of fossil fuels for heating, transportation and electricity, release greenhouse gases that are accumulating and causing global warming. Average global temperatures are rising – the 20th century was the warmest the world has seen in 1,000 years, and the 1980s and 1990s were the warmest decades on record. As a northern country, Canada will feel the impacts of climate change more than most countries.

In coming decades, major temperature variations are expected in Quebec. In fact, recent models suggest that Quebec could warm by as much as 4 to 6°C by 2080. Such changes will be the largest and most rapid of the last 10,000 years and will have profound effects on our lives and the ecosystems that support us.

Health

More frequent and severe heat waves could lead to more deaths, and increase the risk of heat-stress related health problems, especially in the very young and the elderly. However, in the winter months, deaths from exposure to extreme cold and other winter hazards will be reduced.

Warmer daytime temperatures will likely increase the frequency and extent of "bad air days" in major centres. An increase in overnight temperatures during the summer will leave a large part of the population more uncomfortable.

Furthermore, respiratory disorders and allergy problems may worsen, as temperature and humidity rise. Infectious diseases may extend their range northward into Canada, and opportunities for environmental contamination by bacteria, viruses and parasites may increase as well.

Weather

In January 1998, half of the population of Quebec was left without power in the wake of an ice storm. The 1996 Saguenay flood caused \$800 million in damages and resulted in 10 deaths. In the Montréal and Montérégie regions, over 20 events, including violent winds, torrential rains, flooding and hail, are reported each year. Although weather events such as these are natural phenomena, studies suggest that they could become more frequent as our climate changes.

The St. Lawrence

Low water levels are a particular concern for Montréal. From 1991 to 1998, a drop of just 30 centimetres in the water level resulted in a 15 percent decrease in tonnage handled by the port of Montréal. In future, water levels are projected to drop by over 1 metre. Increased dredging may become

Quebec



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necessary to allow ships to continue to navigate the river. Lower water levels would also reduce the amount of quality water for drinking, destroy wetland habitat and limit leisure activities.

In the estuary and the gulf, reduced inflow of colder fresh water from Labrador, and an increase in sea levels will likely result from climate change. These changes could lead to increased coastal erosion to more sensitive waterfront property, loss of wildlife habitat and a change in the distribution of marine species.

Forests

In the long term, climate change is expected to push the tree line farther north, and gradually change the abundance and distribution of tree species. In the short term, climate change will present both challenges and opportunities to Quebec forests.

While a warmer and more humid climate is expected to encourage forest growth, the reproduction of some species would be restricted. Increased precipitation

may decrease the number of forest fires in the province, although a rise in the number of local and exotic forest pests (both insects and rodents) will likely offset any potential benefits. Furthermore, an increase in the frequency of extreme weather events would make forest ecosystems more vulnerable to pests and diseases.

Agriculture

Climate change will affect agriculture by accelerating the maturation rate of plants and lengthening the growing season. Some crops may benefit from the changes, while others will suffer. For example, production of fruits and vegetables in southern Quebec could expand northward, if the soil is suitable for cultivation. However, other crops may be vulnerable to new pests and diseases. The volume of maple syrup produced may also be affected by climate change, as syrup production is closely linked to freeze-thaw cycles.

Taking Action

Given the potentially serious and long-term nature of the risks associated with these impacts, the only prudent course is to take action now to reduce the emissions that contribute to climate change. Analysis shows that the impact on Canadian jobs and economic growth associated with reducing greenhouse gas reductions can be kept modest and manageable relative to the strong growth expected over the next decade.

To give a sense of the possible order of magnitude of the impacts on industry, the estimated economic impact of implementing steps one and two in the Climate Change Plan for Canada to meet Canada's Kyoto commitments ranges from -0.4 percent to -1.6 percent of Canada's gross domestic product, dependent on various assumptions.

This is a modest impact relative to the strong economic growth expected over this period. Analysis shows job growth of 1.08 to almost 1.26 million jobs by 2010, compared to just over 1.32 million in a business as usual scenario. That means a delay in job creation of about 62,000 jobs across Canada in the year 2010. By comparison, the Canadian economy is currently creating new jobs at a rate of about 46,000 per month.

Estimates indicate that with the implementation of actions to reduce greenhouse gas emissions,

Quebec's provincial gross domestic product in the year 2010 would grow to a level that would be about 0.24 percent less than in a business as usual scenario. Growth in new jobs would slow by approximately 0.5 percent, or a delay in job creation over the next eight years of about 16,900 new jobs. To put this into context, Quebec's economy created approximately 116,400 jobs over the last year.

These economic forecasts do not reflect the significant environmental and health benefits to be gained by addressing climate change. Taking action will provide broader benefits including cleaner air, reduced health costs and other environmental and social benefits for Canadians.

The impact on personal disposable income by 2010 would be approximately 0.16 percent less than business as usual. Relative to what they would otherwise be, electricity prices could drop by approximately

0.52 cents/KWh. Gasoline prices are expected to remain at their business-as-usual level in 2010.

An illustrative example of production increases for major industrial emitters in the province as a result of measures to reduce greenhouse gases (national averages) is as follows:

- **aluminum** would rise by 0.23 percent, or \$4.73 per tonne
- **pulp and paper** would rise by 0.06 percent, about 59 cents per tonne
- **steel – conventional** would rise by 0.29 percent, about \$2.10 per tonne
- **steel – electric arc** would rise by 0.08 percent, or 60 cents per tonne
- **electricity –gas** would rise by 0.04 cents per KWH or 0.60 percent

Canada's approach to reducing greenhouse gas emissions is designed to minimize costs and maximize opportunities for Canadian technology. It envisions an economy that is based on cleaner sources of energy, using leading edge technologies. The Plan proposes strategic investments in innovative climate change proposals and the creation of a Partnership Fund that will cost-share emission reductions in collaboration with provincial and territorial governments as well as municipalities, Aboriginal communities and the private sector.

By drawing on Canadian innovation, and by ensuring that different sectors of the economy, regions and consumers play a role in taking action on climate change, the impact is more manageable for all. Working together, Canada can position itself as a strong competitor as the world moves to a new, less carbon-intensive economy.

Quebec-based companies and communities are already showing leadership in meeting the challenges of climate change¹:

- Agropur Coopérative Agro-Alimentaire's cheddar cheese factory uses leading-edge technological innovations to foster energy efficiency in its wastewater treatment plant. This allows the plant to save \$100,000 in annual energy costs, cuts sludge by 90 percent and generates about \$50,000 in usable methane. The company recently installed another device that saves 30 percent on energy used for lagoon aeration.
- In Montreal, commuters are riding 155 "biodiesel" buses that are testing the use of alternative fuels. The \$1.3-million BIOBUS project will help assess the environmental,

economic and social advantages of introducing biodiesel in Canada and will help bring renewable fuels, such as biodiesel made from recycled sub-food-grade vegetable oil and animal fats, to the marketplace. The result could be a less polluting and less environmentally harmful fuel and new economic opportunities for farmers.

- In conjunction with Natural Resources Canada, the Cree community of Oujé-Bougoumou, developed an alternative community energy system that uses large volumes of wood waste produced by a local sawmill. Annual carbon dioxide emissions have been reduced by an estimated 2,300 tonnes per year.

¹ Examples are taken from the public record.

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Climate Change in Nova Scotia

There is broad scientific consensus on the reality of climate change. It is happening, and it has serious implications—for our health, our economy, and our future.

Human activities, including the heavy use of fossil fuels for heating, transportation and electricity, release greenhouse gases that are accumulating and causing global warming. Average global temperatures are rising—the 20th century was the warmest the world has seen in 1,000 years, and the 1980s and 1990s were the warmest decades on record. As a northern country, Canada will feel the impacts of climate change more than most countries.

Over the next 100 years, temperature increases of 3 to 4°C are projected for the Atlantic Provinces. Changes in precipitation patterns and an increase in extreme events are also anticipated. These climate changes are expected to be the largest and most rapid of the last 10,000 years and will have profound effects on our lives and the ecosystems that support us.

Oceans

Scientists predict that climate warming will change ocean temperatures and affect marine ecosystems. Fish are sensitive to temperature, therefore changing temperatures would influence the distribution and population abundance of some species. Furthermore, climate warming may increase the range and extent of the organisms responsible for toxic algae blooms, such as red tides. Toxic blooms pose a serious threat to both fish populations and human health.

Agriculture

A longer, warmer summer would lengthen the growing season and increase the yield of warm-weather crops, such as corn, soybeans, and grapes. However, these conditions could also result in more droughts and a greater need for irrigation. Warmer winters may benefit agriculture by reducing winter kill of forage and fruit,

but create problems for farmers by increasing the range and abundance of insect pests.

An increase in extreme weather events, including storms, hail, floods, and drought, may be the greatest concern for agriculture. These events damage crops and livestock, and may affect hydro power availability and power lines.

Rising sea level and storm surges

As temperatures warm, oceans will expand, causing sea levels to rise. Canadian research suggests that sea levels on the Atlantic coast of Nova Scotia could rise by 70 cm by 2100.

The majority of the Atlantic coast of Nova Scotia is highly sensitive to rising sea levels. The most sensitive areas are low-lying salt marshes, barrier beaches, and lagoons. Higher sea levels will cause increased erosion, smaller or disappearing



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beaches, and flooding of coastal freshwater marshes. They will also affect coastal infrastructure, such as bridges, wharves, breakwaters, and roads.

Storm surges form when low pressure and strong onshore winds combine to raise the water level a metre or more above normal. As sea levels rise dramatically over the next century, storm surges will be able to flood areas never before flooded. Low-lying coastal areas will be the most threatened.

The air we breathe

The number of “bad air days” caused by smog events is expected to increase due to climate warming. Smog is a mix of pollutants, including nitrogen oxides (NO_x) and volatile organic compounds (VOC), which react together in sunlight to form ground level ozone. This ozone is harmful to human health, causing impaired lung function, increased hospital admissions, and premature death. The very young, the elderly, and those with chronic lung diseases, such as asthma, are at the greatest risk.

Freshwater

Changing stream flow patterns and rising sea levels could threaten the province’s water resources. Over recent years, stream water volumes have been decreasing. This trend will likely continue as the climate warms. Meanwhile, sea level rise spurred by warming oceans and melting glaciers will increase the risk of saltwater intrusion into groundwater aquifers.

Forests

Climate change may increase the risks to forests in Nova Scotia. For example, warmer winter temperatures may allow invasive insects, such as the gypsy moth, to become more pervasive, while warmer, drier summers would increase the threat of forest fires in the province. Forest type may also be affected by climate change. As temperatures increase, the province’s boreal forests may gradually be replaced by temperate forests. However, the rate and extent of change will be limited by soil conditions and vegetation life cycles.

Taking Action

Given the potentially serious and long-term nature of the risks associated with these impacts, the only prudent course is to take action now to reduce the emissions that contribute to climate change. Analysis shows that the impact on Canadian jobs and economic growth associated with reducing greenhouse gas reductions can be kept modest and manageable relative to the strong growth expected over the next decade.

To give a sense of the possible order of magnitude of the impacts on industry, the estimated economic impact of implementing steps one and two in the Climate Change Plan for Canada to meet Canada’s Kyoto commitments ranges from -0.4 percent to -1.6 percent of Canada’s gross domestic product, dependent on various assumptions.

This is a modest impact relative to the strong economic growth expected over this period. Analysis shows job growth of 1.08 to almost 1.26 million jobs by 2010, compared to just over 1.32 million in a business as usual scenario. That means a delay in job creation of about 62,000 jobs across Canada in the year 2010. By comparison, the Canadian economy is currently creating new jobs at a rate of about 46,000 per month.

Estimates indicate that with the implementation of actions to reduce greenhouse gas emissions, Nova

Scotia’s provincial gross domestic product in the year 2010 would grow to a level that would be about 0.30 percent less than in a business as usual scenario. Growth in new jobs would slow by approximately 0.4 percent, or a delay in job creation over the next eight years of about 1,800 new jobs. Over the past year, there was a net loss of approximately 600 jobs in Nova Scotia.

These economic forecasts do not reflect the significant environmental and health benefits to be gained by addressing climate change. Taking action will provide broader benefits including cleaner air, reduced health costs and other environmental and social benefits for Canadians.

The impact on personal disposable income by 2010 would be approximately 0.22 percent less than business as usual. Relative to what they would otherwise be, electricity prices could rise by

approximately 0.06 cents/KWh. Gasoline prices are expected to remain at their business as usual level in 2010.

An illustrative example of production increases for major industrial emitters in the province as a result of measures to reduce greenhouse gases (national averages) is as follows:

- **natural gas** would rise by 0.5 cents/million cubic feet, or 0.14 percent
- **electricity – coal** would rise by 0.14 cents per KWH, or by 1.94 percent
- **electricity – gas** would rise by 0.04 cents per KWH or 0.60 percent
- **pulp and paper** would rise by 0.06 percent, about 59 cents per tonne

The Plan foresees continued growth in offshore oil and gas production.

Canada's approach to reducing greenhouse gas emissions is designed to minimize costs and maximize opportunities for Canadian technology. It envisions an economy that is based on cleaner sources of energy, using leading edge technologies. The Plan proposes strategic investments in innovative climate change proposals and the creation of a Partnership Fund that will cost-share well as municipalities, Aboriginal communities and the private sector.

By drawing on Canadian innovation, and by ensuring that different sectors of the economy, regions and consumers play a role in taking action on climate change, the impact is more manageable for all. Working together, Canada can position itself as a strong competitor as the world moves to a new, less carbon-intensive economy.

Nova Scotia-based companies and communities are already showing leadership in meeting the challenges of climate change¹:

- Clean Nova Scotia's Climate Change Centre offers a Home Tune-up Program to help homeowners identify actions they can take in their homes and communities to address climate change. These two-hour home assessments help to lower heating costs and reduce emissions through energy efficiency, water conservation, environmental transportation choices and reduced solid waste generation.

- By implementing a new municipal solid waste management system, the Halifax Regional Municipality has significantly decreased the amount of waste that goes to landfill. As a result, greenhouse gas emissions from the municipality's landfill site have been reduced by 1.4 tonnes per resident compared to 1995 levels.
- Stora Enso Port Hawkesbury, of Point Tupper, Nova Scotia, commissioned a new liquor concentrator that helped reduce its proportion of in-plant energy generated by fossil fuels from 27.6 percent to 21.5 percent within one year.

¹ Examples are taken from the public record.

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New Brunswick



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Climate Change in New Brunswick

There is broad scientific consensus on the reality of climate change. It is happening, and it has serious implications—for our health, our economy, and our future.

Human activities, including the heavy use of fossil fuels for heating, transportation and electricity, release greenhouse gases that are accumulating and causing global warming. Average global temperatures are rising—the 20th century was the warmest the world has seen in 1,000 years, and the 1980s and 1990s were the warmest decades on record. As a northern country, Canada will feel the impacts of climate change more than most countries.

Over the next 100 years, temperature increases of 3 to 4°C are projected for the Atlantic Provinces. Changes in precipitation patterns and an increase in extreme events are also anticipated. These climate changes are expected to be the largest and most rapid of the last 10,000 years and will have profound effects on our lives and the ecosystems that support us.

The air we breathe

The number of “bad air days” caused by smog is expected to increase due to a warming climate. The city of Saint John is already experiencing more smoggy days. Smog is a mix of pollutants, including nitrogen oxides (NO_2) and volatile organic compounds (VOC), which react together in sunlight to form ground level ozone. This ozone is harmful to human health, causing impaired lung function, increased hospital admissions, and premature death. The very young, the elderly, and those with chronic lung diseases, such as asthma, are at the greatest risk.

Bodies of water

Due to a warming trend in New Brunswick, the number of mild days in winter has been increasing and large peak flows on the

St. John River in late winter are becoming more common. If this warming trend continues, ice breakup and flooding on the river will become more frequent and unpredictable. This could increase damage to property, highways, and bridges, and force power companies to change the management regimes of their reservoirs.

Forests

The risk of trees blowing down may increase, as storms become more frequent and intense as a result of climate change. For example, a massive blowdown in 1994 caused 30 million trees to be felled and cost \$100 million in damages.

Warmer winter temperatures may allow invasive insects such as the gypsy moth to become more pervasive. This is because prolonged temperatures at or below -9°C,



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or short periods below -23°C, are necessary to limit the development and survival of this species.

All of these conditions could result in stresses on existing tree species, the elimination of some, and the introduction of others.

Agriculture

A longer, warmer summer would lengthen the growing season and increase the yield of warmer weather crops such as soybeans, winter cereals, corn, and grapes. However, these conditions could also result in more droughts and a greater need for irrigation. Warmer winters may benefit agriculture by reducing winterkill of forage and fruit, but could also create problems for farmers by increasing the range and abundance of insect pests.

An increase in extreme weather events, including storms, hail, floods, and drought, may be the greatest concern for agriculture. These events damage crops and livestock, and may affect the availability of electric power and communication lines.

Oceans

Scientists project that a warmer climate will change ocean temperatures and affect marine ecosystems. Fish are sensitive to temperature; therefore changing temperatures would influence the distribution and population abundance of some species. Furthermore, climate change may increase the range and extent of the organisms responsible for toxic algae blooms, such as red tides. Toxic blooms pose a serious threat to both fish populations and human health.

Storm surges and coastal flooding

Storm surges form when low pressure and strong onshore winds combine to raise the water level a metre or more above normal. As sea levels on the Atlantic coast are expected to rise dramatically over the next century, storm surges will be able to flood areas never before flooded. Low-lying coastal areas will be the most threatened. Sinking of coastal land could compound the problem, as much of the New Brunswick coast is low-lying and sensitive to erosion and flooding.

Taking Action

Given the potentially serious and long-term nature of the risks associated with these impacts, the only prudent course is to take action now to reduce the emissions that contribute to climate change. Analysis shows that the impact on Canadian jobs and economic growth associated with reducing greenhouse gas reductions can be kept modest and manageable relative to the strong growth expected over the next decade.

To give a sense of the possible order of magnitude of the impacts on industry, the estimated economic impact of implementing steps one and two in the Climate Change Plan for Canada to meet Canada's Kyoto commitments ranges from -0.4 percent to -1.6 percent of Canada's gross domestic product, dependent on various assumptions.

This is a modest impact relative to the strong economic growth expected over this period. Analysis shows job growth of 1.08 to almost 1.26 million jobs by 2010, compared to just over 1.32 million in a business as usual scenario. That means a delay in job creation of about 62,000 jobs across Canada in the year 2010. By comparison, the Canadian economy is currently creating new jobs at a rate of about 46,000 per month.

Estimates indicate that with the implementation of actions to reduce greenhouse gas emissions, New Brunswick's provincial gross domestic product

in the year 2010 would grow to a level that would be about 0.22 percent less than in a business as usual scenario. Growth in new jobs would slow by approximately 0.4 percent, or a delay in job creation over the next eight years of about 1,500 new jobs. To put this into context, New Brunswick's economy created approximately 10,100 jobs over the past year.

These economic forecasts do not reflect the significant environmental and health benefits to be gained by addressing climate change. Taking action will provide broader benefits including cleaner air, reduced health costs and other environmental and social benefits for Canadians.

The impact on personal disposable income by 2010 would be approximately 0.16 percent less than business as usual. Relative to what they would otherwise be, electricity prices could drop by approximately 0.24 cents/KWh. Gasoline prices

are expected to remain at their business-as-usual level in 2010.

An illustrative example of production increases for major industrial emitters in the province as a result of measures to reduce greenhouse gases (national averages) is as follows:

- **pulp and paper** would rise by 0.06 percent, about 59 cents per tonne
- **electricity** – coal would rise by 0.14 cents per KWH, or by 1.94 percent
- **steel** – conventional would rise by 0.29 percent, about \$2.10 per tonne

Canada's approach to reducing greenhouse gas emissions is designed to minimize costs and

maximize opportunities for Canadian technology. It envisions an economy that is based on cleaner sources of energy, using leading edge technologies. The Plan proposes strategic investments in innovative climate change proposals and the creation of a Partnership Fund that will cost-share well as municipalities, Aboriginal communities and the private sector.

By drawing on Canadian innovation, and by ensuring that different sectors of the economy, regions and consumers play a role in taking action on climate change, the impact is more manageable for all. Working together, Canada can position itself as a strong competitor as the world moves to a new, less carbon-intensive economy.

New Brunswick-based companies and communities are already showing leadership in meeting the challenges of climate change¹:

- A cogeneration facility, which produces electricity and usable heat at the same time, at Nexfor Inc.'s wood products plant has reduced fuel costs 75 percent by replacing fossil fuels, such as oil, gas and coal, with wood waste and with energy efficiency projects. In 1998, Nexfor reduced its greenhouse gas emissions 23.1 percent below 1990 levels.

- By installing a variable frequency drive on a kiln exhaust fan at its Havelock, New Brunswick facility, Graymont Inc. reduced electricity consumption by about eight percent – a net savings of 558,000 KWh per year.
- Energy efficiency initiatives at Repap New Brunswick Inc. have resulted in a decrease of total electrical power usage from 1.94 to 1.69 megawatt hours per tonne (12.9 percent).

¹ Examples are taken from the public record.

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Climate Change in Prince Edward Island

There is broad scientific consensus on the reality of climate change. It is happening, and it has serious implications – for our health, our economy, and our future.

Human activities, including the heavy use of fossil fuels for heating, transportation and electricity, release greenhouse gases that are accumulating and causing global warming. Average global temperatures are rising – the 20th century was the warmest the world has seen in 1,000 years, and the 1980s and 1990s were the warmest decades on record. As a northern country, Canada will feel the impacts of climate change more than most countries.

Over the next 100 years, temperature increases of 3 to 4°C are projected for the Atlantic Provinces. Changes in precipitation patterns and extreme events are also anticipated. These climate changes are expected to be the largest and most rapid of the last 10,000 years and will have profound effects on our lives and the ecosystems that support us.

The air we breathe

The number of “bad air days” caused by smog events is expected to increase due to climate warming. Smog is a mix of pollutants, including nitrogen oxides (NO_2), and volatile organic compounds (VOC), which react together in sunlight to form ground level ozone. This ozone is harmful to human health, causing impaired lung function, increased hospital admissions, and premature death. The very young, the elderly, and those with chronic lung diseases, such as asthma, are at the greatest risk.

Agriculture

Agriculture is the largest industry in PEI. Although a longer, warmer summer would lengthen the growing season and increase the yield of warm-weather crops, these conditions could also result in more

droughts and a greater need for irrigation. Warmer winters may benefit agriculture, by reducing winter kill of forage and fruit, yet create problems for farmers by increasing the range and abundance of insect pests.

An increase in extreme weather events, such as storms, hail, floods, and drought, may be the greatest concern for agriculture. These events damage crops and livestock, and can affect hydro power availability and power lines.

Aquaculture

Aquaculture is a rapidly expanding industry in PEI. The province’s estuaries are ideally suited for the cultivation of shellfish, particularly mussels and oysters. PEI also has fresh water trout and char farms.

For some shellfish species, such as oysters, a long, warm summer may improve the conditions for growth and reproduction.



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Oysters hibernate in winter, so warmer, shorter winters may favour their winter survival. On the other hand, species such as mussels prefer cooler water and warm summer temperatures can be more stressful. Warmer, shorter winters may result in poor ice conditions that hamper winter harvest of mussels. Increases in extreme weather events can be a concern for all aquaculturists. Storms can damage culture equipment and result in loss of stocks. Erosion of land can result in heavy silt forming in rivers, which can be stressful for cultured fish or, when reaching the estuaries, can smother oysters being grown on the river bottom.

Changing ecosystems

The dune systems, marshes, and ponds of Prince Edward Island National Park provide critical habitat for migratory shorebirds. The higher sea levels expected to result from climate change will threaten this habitat, and place stress on shorebird populations. The distribution and population of key fish species may also be affected by climate change, as fish are extremely sensitive to temperature.

Rising sea level and storm surges

Much of the coast of Atlantic Canada is highly sensitive to the effects of sea level rise. The most sensitive coasts are low-lying, with salt marshes, barrier beaches, and lagoons. Projected consequences of sea level rise include increased erosion, rapid migration of beaches, and flooding of coastal freshwater marshes.

Storm surges form when low pressure and strong onshore winds combine to raise the water level a metre or more above normal. As warmer temperatures cause sea levels to rise dramatically over the next century, storm surges will be able to flood areas never before flooded. For example, a storm surge of 4.2 m, combined with a 0.5 m sea level rise, would place over 300 properties in Charlottetown at risk.

Rising sea levels and storm surges may also destroy popular beaches and dunes, and damage heritage buildings. This will affect tourism, which is the second most important sector of the province's economy.

Taking Action

Given the potentially serious and long-term nature of the risks associated with these impacts, the only prudent course is to take action now to reduce the emissions that contribute to climate change. Analysis shows that the impact on Canadian jobs and economic growth associated with reducing greenhouse gas reductions can be kept modest and manageable relative to the strong growth expected over the next decade.

To give a sense of the possible order of magnitude of the impacts on industry, the estimated economic impact of implementing steps one and two in the Climate Change Plan for Canada to meet Canada's Kyoto commitments ranges from -0.4 percent to -1.6 percent of Canada's gross domestic product, dependent on various assumptions.

This is a modest impact relative to the strong economic growth expected over this period. Analysis shows job growth compared to just over 1.32 million in a business as usual scenario. That means a delay in job creation of about 62,000 jobs across Canada in the year 2010. By comparison, the Canadian economy is currently creating new jobs at a rate of about 46,000 per month.

Estimates indicate that with the implementation of actions to reduce greenhouse gas emissions, Prince Edward Island's provincial gross domestic product in the year 2010 would grow to a level that would be about 0.36 percent less than in a business as usual scenario. Growth in new jobs would slow by approximately 0.4 percent, or a delay in job creation over the next eight years of about 300 new jobs. To put this into context, PEI's economy created approximately 1,600 jobs over the past year.

These economic forecasts do not reflect the significant environmental and health benefits to be gained by addressing climate change. Taking action will provide broader benefits including cleaner air, reduced health costs and other environmental and social benefits for Canadians.

The impact on personal disposable income by 2010 would be approximately 0.31 percent less than business-as-usual. Relative to what they would otherwise be, electricity prices could drop by 0.57 cents/KWh. Gasoline prices are expected to remain at their business-as-usual level in 2010.

An illustrative example of production increases for major industrial emitters in the province as a result of measures to reduce greenhouse gases (national averages) is as follows:

- **electricity – gas** would rise by 0.04 cents per KWH or 0.60 percent
- **electricity – oil** would rise by 0.12 cents per KWH or 1.57 percent

Canada's approach to reducing greenhouse gas emissions is designed to minimize costs and maximize opportunities for Canadian technology.

Prince Edward Island-based companies and communities are already showing leadership in meeting the challenges of climate change¹:

- PEI is at the forefront of renewable energy technology as home to the first wind farm in Atlantic Canada. For over two decades, the Atlantic Wind Test Site has provided world-class research into the capacity of wind energy. Now, Islanders and the environment are benefiting. A partnership between the federal and provincial governments, Prince Edward Island Energy Corporation and Maritime Electric Corporation has seen the addition of a commercial wind farm to the North Cape Site, that is providing a clean and renewable source of electricity to the Island.
- Renewable energy is a key component of addressing climate change. Already, with Government of Canada support — and partners

It envisions an economy that is based on cleaner sources of energy, using leading edge technologies. The Plan proposes strategic investments in innovative climate change proposals and the creation of a Partnership Fund that will cost-share emission reductions in collaboration with provincial and territorial governments as well as municipalities, Aboriginal communities and the private sector.

By drawing on Canadian innovation, and by ensuring that different sectors of the economy, regions and consumers play a role in taking action on climate change, the impact is more manageable for all. Working together, Canada can position itself as a strong competitor as the world moves to a new, less carbon-intensive economy.

such as Suncor and Enbridge – windmills are generating electricity in Prince Edward Island. This green energy is helping people power their homes in Prince Edward Island.

- Reducing emissions associated with transportation will also be important in Canada's efforts to meet our Kyoto commitments. In an effort to raise awareness of transportation issues, the Environmental Coalition of Prince Edward Island developed the Sustainable Transportation Initiative. The project aims to identify barriers to alternative modes of transportation, encourage the use of alternative methods of transportation, establish a PEI ride sharing network, and offer businesses energy use assessments and recommendations on the reduction of energy use.

¹ Examples are taken from the public record.

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Climate Change in Newfoundland and Labrador

There is broad scientific consensus on the reality of climate change. It is happening, and it has serious implications—for our health, our economy, and our future.

Human activities, including the heavy use of fossil fuels for heating, transportation and electricity, release greenhouse gases that are accumulating and causing global warming. Average global temperatures are rising—the 20th century was the warmest the world has seen in 1,000 years, and the 1980s and 1990s were the warmest decades on record. As a northern country, Canada will feel the impacts of climate change more than most countries.

Over the next 100 years, temperature increases of 3 to 4°C are projected for the Atlantic Provinces. Changes in precipitation patterns and an increase in extreme events are also anticipated. These climate changes are expected to be the largest and most rapid of the last 10,000 years and will have profound effects on our lives and the ecosystems that support us.

Sea ice

In the short term, climate change may increase the number of icebergs, which could be hazardous to ships. In the long term, climate change is projected to reduce the thickness and extent of sea ice. This may lengthen the shipping season and reduce the need for icebreakers. However, less sea ice will also increase the exposure of beaches to winter storm waves, and increase both coastal erosion and storm damage to buildings and structures like piers. In some areas of Newfoundland, surveyors have already observed considerable erosion along the coastline.

Changing ecosystems

Warmer temperatures and changing precipitation patterns are expected to affect the distribution, health, and accessibility of wildlife and fish. Changes in river flow,

such as earlier ice breakup, stronger spring runoff and reduced summer flow, would impact several species, including the threatened Harlequin duck of Labrador.

Marine species

Changing temperatures are expected to influence the numbers and distribution of some fish species. For example, cod are strongly influenced by water temperature. Between 1900 and 1920, warmer temperatures allowed cod to migrate northwards, and then when the water temperature dropped after 1930, they retreated southwards. Cod size is also affected by temperature, with larger cod found in warmer waters. Significant warming of fresh water bodies could also affect the numbers and distribution of trout and salmon.



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Rising sea level and vanishing coasts

Rising sea levels will affect sensitive low-lying coastal areas. Salt marshes and lagoons that are currently freshwater could be flooded by seawater, affecting the habitat of fish and wildlife. Barrier beaches may recede, and there may be increased erosion along some of the coastline. Erosion such as that threatening the lighthouse at Pointe Verde, Newfoundland will become more prevalent in the future.

Bodies of water

Hydroelectricity is an important source of power in Newfoundland and Labrador. Long-term changes in annual precipitation would affect overall generation capability, although electric power systems with dams and reservoirs are likely to be able to adjust their operating practices to accommodate these changes. However, hydroelectric systems without

reservoirs would be more vulnerable to changes in precipitation levels.

Lowered water levels or decreased river flows in some areas could lead to poor water quality. Increases in temperatures, prolonged summer seasons, and heavier rainfall could also increase the risk of waterborne parasites, such as Giardia and Cryptosporidium, contaminating drinking water.

Storm surges and coastal flooding

Storm surges form when low-pressure weather systems and strong onshore winds combine to raise the water level a metre or more above normal. As sea level is expected to rise dramatically over the next century, storm surges will be able to flood areas never before flooded. Flooding is already a problem in Newfoundland and Labrador, where flood damages over the last 15 years have exceeded \$40 million.

Taking Action

Given the potentially serious and long-term nature of the risks associated with these impacts, the only prudent course is to take action now to reduce the emissions that contribute to climate change. Analysis shows that the impact on Canadian jobs and economic growth associated with reducing greenhouse gas reductions can be kept modest and manageable relative to the strong growth expected over the next decade.

To give a sense of the possible order of magnitude of the impacts on industry, the estimated economic impact of implementing steps one and two in the Climate Change Plan for Canada to meet Canada's Kyoto commitments ranges from -0.4 percent to -1.6 percent of Canada's gross domestic product, dependent on various assumptions. This is a modest impact relative to the strong economic growth expected over this period.

Analysis shows job growth of 1.08 to almost 1.26 million jobs by 2010, compared to just over 1.32 million in a business as usual scenario. That means a delay in job creation of about 62,000 jobs across Canada in the year 2010. By comparison, the Canadian economy is currently creating new jobs at a rate of about 46,000 per month.

Estimates indicate that with the implementation of actions to reduce greenhouse gas emissions, Newfoundland and Labrador's provincial gross

domestic product in the year 2010 would grow to a level that would be about 0.17 percent less than in a business as usual scenario. Growth in new jobs would slow by approximately 0.5 percent, or a delay in job creation over the next eight years of about 1,100 new jobs. Over the past year, there was a net loss of approximately 1,200 jobs in Newfoundland and Labrador.

These economic forecasts do not reflect the significant environmental and health benefits to be gained by addressing climate change. Taking action will provide broader benefits including cleaner air, reduced health costs and other environmental and social benefits for Canadians.

The impact on personal disposable income by 2010 would be approximately 0.16 percent less than business as usual. Relative to what they would otherwise be, electricity prices could drop by approximately 0.06 cents/KWh. Gasoline prices

are expected to remain at their business-as-usual level in 2010.

An illustrative example of production increases for major industrial emitters in the province as a result of measures to reduce greenhouse gases (national averages) is as follows:

- **electricity** – oil would rise by 0.12 cents per KWH or 1.57 percent

The Plan foresees a four-fold increase in Newfoundland offshore oil production.

The modelling has also also made allowances for increased greenhouse gas emissions associated with the new Voisey's Bay mining and smelter operations. There is every reason to believe that Newfoundland and Labrador's economic development will be essentially unaffected by the Plan.

These economic forecasts do not reflect the significant environmental and health benefits of addressing climate change. Taking action will provide broader benefits

including cleaner air, reduced health costs and other environmental and social benefits for Canadians.

Canada's approach to reducing greenhouse gas emissions is designed to minimize costs and maximize opportunities for Canadian technology. It envisions an economy that is based on cleaner sources of energy, using leading edge technologies. The Plan proposes strategic investments in innovative climate change proposals and the creation of a Partnership Fund that will cost-share well as municipalities, Aboriginal communities and the private sector.

By drawing on Canadian innovation, and by ensuring that different sectors of the economy, regions and consumers play a role in taking action on climate change, the impact is more manageable for all. Working together, Canada can position itself as a strong competitor as the world moves to a new, less carbon-intensive economy.

Newfoundland-based companies and communities are already showing leadership in meeting the challenges of climate change¹:

- Through a program known as Climate Change Action: The Job Begins at Home, youth-driven Eco-Teams are providing HomeGreenUp and EnerGuide assessments to homeowners throughout the province. Residents learn how to reduce greenhouse gas emissions and energy and water consumption, divert waste and curb harmful transportation practices.

- On September 12, 2002, Conservation Corps launched the Climate Change Education Centre – a Web site providing tools and facts about the impacts and adaptations of climate change for Newfoundland Labrador. The project was sponsored by The Government of Newfoundland and Labrador, the Government of Canada, and Newfoundland and Labrador Hydro.

¹ Examples are taken from the public record.

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Climate Change in Nunavut

There is broad scientific consensus on the reality of climate change. It is happening, and it has serious implications—for our health, our economy, and our future.

Human activities, including the heavy use of fossil fuels for heating, transportation and electricity, release greenhouse gases that are accumulating and causing global warming. Average global temperatures are rising—the 20th century was the warmest the world has seen in 1,000 years, and the 1980s and 1990s were the warmest decades on record. As a northern country, Canada will feel the impacts of climate change more than most countries.

Scientists predict that by the end of the 21st century, temperatures in the Arctic will be at least 5 degree Celsius warmer than they are today. Across Nunavut, we are already seeing changes in seasonal conditions, including warmer year-round temperatures, unpredictable weather, a shift in prevailing wind direction, less snow and rain, and changing snow and ice conditions. These changes are making it more dangerous and difficult to travel and to access resources.

In western Hudson Bay, ice break up is occurring two weeks earlier, on average, than it did 20 years ago. This shortens the time available for polar bears to fatten up on their main food source, ringed seals, before going on shore where they fast. As a result, adult bears have been getting lighter and females, who fast until weaning their cubs the next spring, have been having fewer cubs.

Projections for the future include rising sea levels, a reduction in the extent and thickness of sea ice, and more extreme weather events, all of which may increase erosion and flooding of coastal communities.

Nunavut



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Life on the land

Melting of permafrost may cause the rupture and buckling of pipelines and storage tanks used for water and sewage. Roads, airstrips and buildings will also suffer from less stable ground, particularly in areas where the soil contains a lot of ice.

Computer models project that warmer temperatures could increase the number and types of plants available for plant-eating animals. However, the number of insects

and parasites may also increase. This may lead to a decline in the number and health of large mammals like caribou and muskox.

Life at sea

With warmer temperatures, the Northwest Passage may be ice-free for up to 100 days each year, allowing ships to use it as an international trade route. While this may bring opportunities to the territory, there are also environmental and social issues to consider. For example, whale populations



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may be affected by the increased noise, pollution and ship traffic, or vessels unsuitable for Arctic conditions may spill oil or other materials into the environment.

Most climate change computer models predict significant reductions of glaciers and sea ice. In fact, some models suggest that all summer ice cover in the north will disappear by 2100. This, with overall warmer conditions, may affect the range and number of several marine mammals. The changes may open up more areas of suitable habitat in the eastern Arctic, but reduce habitat in southern regions. Walruses and bearded, ringed, harp and hooded seals may lose the

sea ice platforms they use for breeding, nursing pups, resting and molting.

Changing lives

Changes to the range, number and health of animals, fish and plant species will ultimately affect the lives of Nunavummiut who depend on them, leading to a change in hunting and harvesting practices, and a loss of traditional food. Adaptation has always been the way of life in the north, however, the rate at which changes are predicted to occur makes adaptation more challenging in the future.

Taking Action

Given the potentially serious and long-term nature of the risks associated with these impacts, the only prudent course is to take actions now to reduce the emissions that contribute to climate change. Analysis shows that the impact on Canadian jobs and economic growth associated with reducing greenhouse gas reductions can be kept modest and manageable relative to the strong growth expected over the next decade.

To give a sense of the possible order of magnitude of the impacts on industry, the estimated economic impact of implementing steps one and two in the Climate Change Plan for Canada to meet Canada's Kyoto commitments ranges from -0.4 percent to -1.6 percent of Canada's gross domestic product, dependent on various assumptions. This is a modest impact relative to the strong economic growth expected over this period. Analysis shows job growth of 1.08 to almost 1.26 million jobs by 2010, compared to just over 1.32 million in a business as usual scenario. That means a delay in job creation of about 62,000 jobs across Canada in the year 2010. By comparison, the Canadian economy is currently creating new jobs at a rate of about 46,000 per month.

Estimates indicate that with the implementation of actions to reduce greenhouse gas emissions, the provincial gross domestic product for Canada's northern territories in the year 2010 would grow to a level that would be about 0.04 percent less than in a business as usual scenario (combined average for the Northwest Territories, Yukon and Nunavut). Growth in new jobs would slow by approximately

0.1 percent. To put this into context, the economy in Canada's northern territories created approximately 240 jobs over the past year.

These economic forecasts do not reflect the significant environmental and health benefits to be gained by addressing climate change. Taking action will provide broader benefits including cleaner air, reduced health costs and other environmental and social benefits for Canadians.

The impact on personal disposable income by 2010 would be approximately 0.19 percent less than business as usual. Relative to what they would otherwise be, electricity prices could increase by about 0.17 cents/KWh. Gasoline prices are expected to remain at their business-as-usual level in 2010.

An illustrative example of production increases for major industrial emitters in the province as a result of measures to reduce greenhouse gases (national averages) is as follows:

- **electricity** oil would rise by 0.12 cents per KWH or 1.57 percent

Canada's approach to reducing greenhouse gas emissions is designed to minimize costs and maximize opportunities for Canadian technology. It envisions an economy that is based on cleaner sources of energy, using leading edge technologies. The Plan proposes strategic investments in innovative climate change proposals and the creation of a Partnership Fund that will cost-share well as municipalities, Aboriginal communities and the private sector.

Northern Canadian companies are already showing leadership in meeting the challenges of climate change¹:

- By taking an innovative approach to increasing energy efficiency and promoting community involvement, the Northwest Territories Power Corporation has reduced annual greenhouse gas emissions by 47 percent below its 1990 baseline.
- The Yukon Development Corporation, a government agency comprised of the Yukon Energy Corporation and the Energy Solutions

By drawing on Canadian innovation, and by ensuring that different sectors of the economy, regions and consumers play a role in taking action on climate change, the impact is more manageable for all. Working together, Canada can position itself as a strong competitor as the world moves to a new, less carbon-intensive economy.

Centre, is aggressively reducing diesel generation in the Territory, which currently represents 40 percent of electricity generation. The Corporation currently emits 65 percent fewer emissions than in 1990, due in part to reduced electrical load and in part to their comprehensive action plan with cost-effective alternative energy options.

¹ Examples are taken from the public record.

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Northwest Territories



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Climate Change in the Northwest Territories

There is broad scientific consensus on the reality of climate change. It is happening, and it has serious implications—for our health, our economy, and our future.

Human activities, including the heavy use of fossil fuels for heating, transportation and electricity, release greenhouse gases that are accumulating and causing global warming. Average global temperatures are rising—the 20th century was the warmest the world has seen in 1,000 years, and the 1980s and 1990s were the warmest decades on record. As a northern country, Canada will feel the impacts of climate change more than most countries.

Climate change has already started to affect the Northwest Territories. In the last 40 years the Mackenzie River Basin has warmed by 1.5°C. Also during this time, the sea ice has been shrinking and the permafrost has been melting.

Scientists predict that by the end of the 21st century, temperatures in the Northwest Territories will be at least 5°C warmer than they are today. Changes to the environment have already started taking place in the north and will have a significant impact on northern environment and quality of life.

Northern landscapes

The melting permafrost is forcing up the cost of maintaining all weather roads. It also increases the risk of landslides and could cause structural damage to older buildings. Melting permafrost may also negatively affect water supplies and communities' waste disposal systems.

Warmer winters are causing problems for ice roads. They are freezing later and melting earlier in the spring. This has made transporting goods to the communities and mines that depend on these roads more difficult. As the climate changes and temperatures rise, these problems are expected to get worse.

Life on the land

Increased temperatures mean birds, mammals and insects are moving further north every year. Many Dene elders have reported seeing species of birds that have never come as far north before. Mammals like moose, whitetail deer, coyotes, cougars, porcupines, beavers and otters also seem to be migrating north. The warming trend is allowing more species of insects to survive further north, so that flies and mosquitoes are creating problems for both humans and animals.

The caribou are put at risk by the changing climate as well. Changing vegetation, snow conditions and an increase in insects are all affecting calving success.



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The longer summers are also affecting polar bears. Warmer temperatures are causing more ice to melt, resulting in more open water and fewer seal pups surviving, so it is harder for the bears to catch the food they need to stay healthy all winter. This, scientists say, is causing bears to be skinnier than they were 30 years ago. This is also why polar bears are having fewer cubs now than in the past (one or two instead of two or three). If things get worse for the polar bear there is a chance they will disappear from the Hudson Bay area within 50 years.

Early melting of snow and spring rains can destroy seal pups' snow dens and expose them to predators such as polar bears. This, and earlier sea ice breakup has made it more difficult for aboriginal hunters to find and harvest seals.

Of ice and men

Climate change models are projecting major changes in northern sea ice. These models predict most summer ice in the north could disappear by 2100. Early ice breakup or complete loss of ice would have a profound effect on northern lifestyle. Traditional knowledge is used to predict ice conditions and guide hunters in their travels and work. However, as temperatures increase and ice conditions change, this would make predictions more difficult and could make traveling more dangerous.

Communities along the Arctic Coast are experiencing problems because of lower winter ice levels. Open water in early winter is causing stormy waters to erode Tuktoyaktuk's coastline, causing buildings to be abandoned.

Taking Action

Given the potentially serious and long-term nature of the risks associated with these impacts, the only prudent course is to take actions now to reduce the emissions that contribute to climate change. Analysis shows that the impact on Canadian jobs and economic growth associated with reducing greenhouse gas reductions can be kept modest and manageable relative to the strong growth expected over the next decade.

To give a sense of the possible order of magnitude of the impacts on industry, the estimated economic impact of implementing steps one and two in the Climate Change Plan for Canada to meet Canada's Kyoto commitments ranges from -0.4 percent to -1.6 percent of Canada's gross domestic product, dependent on various assumptions.

This is a modest impact relative to the strong economic growth expected over this period. Analysis shows job growth of 1.08 to almost 1.26 million jobs by 2010, compared to just over 1.32 million in a business as usual scenario. That means a delay in job creation of about 62,000 jobs across Canada in the year 2010. By comparison, the Canadian economy is currently creating new jobs at a rate of about 46,000 per month.

Estimates indicate that with the implementation of actions to reduce greenhouse gas emissions, the provincial gross domestic product for Canada's northern territories in the year 2010 would grow to

a level that would be about 0.04 percent less than in a business as usual scenario (combined average for the Northwest Territories, Yukon and Nunavut). Growth in new jobs would slow by approximately 0.1 percent. To put this into context, the economy in Canada's northern territories created approximately 240 jobs over the past year.

These economic forecasts do not reflect the significant environmental and health benefits to be gained by addressing climate change. Taking action will provide broader benefits including cleaner air, reduced health costs and other environmental and social benefits for Canadians.

The impact on personal disposable income by 2010 would be approximately 0.19 percent less than business as usual. Relative to what they would otherwise be, electricity prices could increase by about 0.17 cents/KWh. Gasoline prices are expected to remain at their business-as-usual level in 2010.

An illustrative example of production increases for major industrial emitters in the province as a result of measures to reduce greenhouse gases (national averages) is as follows:

- **conventional oil** would rise by 3 cents per barrel, or by 0.09 percent
- **natural gas** would rise by 0.5 cents/million cubic feet, or 0.14 percent
- **electricity – gas** would rise by 0.04 cents per KWH or 0.60 percent
- **electricity – oil** would rise by 0.12 cents per KWH or 1.57 percent

Canada's approach to reducing greenhouse gas emissions is designed to minimize costs and

maximize opportunities for Canadian technology. It envisions an economy that is based on cleaner sources of energy, using leading edge technologies. The Plan proposes strategic investments in innovative climate change proposals and the creation of a Partnership Fund that will cost-share well as municipalities, Aboriginal communities and the private sector.

By drawing on Canadian innovation, and by ensuring that different sectors of the economy, regions and consumers play a role in taking action on climate change, the impact is more manageable for all. Working together, Canada can position itself as a strong competitor as the world moves to a new, less carbon-intensive economy.

Companies in the Northwest Territories are already showing leadership in meeting the challenges of climate change¹:

- EKATI, Canada's first diamond mine, is recovering waste heat from its generators to produce building heat and conserve fuel. Exhaust stacks on the generators are specially insulated to reduce the demand for heat from diesel heating boilers, thereby reducing fuel consumption. An ongoing preventative maintenance program ensures the generators operate as efficiently as possible and the mine conserves electrical power by using energy-efficient lighting, motors and diamond recovery processes. These and other measures all add up to considerable reductions in energy use, operation costs and greenhouse gas emissions.

- By taking an innovative approach to increasing energy efficiency and promoting community involvement, the Northwest Territories Power Corporation has not only pursued internal greenhouse gas (GHG) mitigation opportunities, they have also taken a leading role in consumer education. The company promotes energy efficiency through the use of customer newsletters and seminars. In several locations, the company installed waste heat recovery systems on diesel generating equipment, which captures thermal energy for local customers, indirectly reducing fuel demand. Overall, the Northwest Territories Power Corporation has reduced annual greenhouse gas emissions by 47 percent below its 1990 baseline.

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Climate Change in the Yukon

There is broad scientific consensus on the reality of climate change. It is happening, and it has serious implications—for our health, our economy and our future.

Human activities, including the heavy use of fossil fuels for heating, transportation and electricity, release greenhouse gases that are accumulating and causing global warming. Average global temperatures are rising—the 20th century was the warmest the world has seen in 1,000 years, and the 1980s and 1990s were the warmest decades on record. As a northern country, Canada will feel the impacts of climate change more than most countries.

In the Yukon, both temperature and precipitation are expected to increase due to climate change. Climate models project that over the next century, temperatures could rise by 2 to 6°C. Fall storms and day-to-day weather variability are also predicted to increase. These climate changes will have profound effects on ecosystems and quality of life.

Northern Landscapes

Permafrost, or perennially frozen ground, can be found in a significant portion of the Yukon. In the southern Yukon, permafrost is discontinuous and may only be present beneath 10 percent of the land area. Further north, the proportion of permanently frozen land increases. In a large part of the Yukon, permafrost is only a few degrees below 0°C. If the climate warms by up to 5 degrees in the next 50 to 100 years, seasonal thaw will increase and permafrost will become thinner or ultimately disappear.

Permafrost melt will increase the risk of landslides, which damage infrastructure, reduce water quality, and harm fish and wildlife. It may also substantially alter ecosystems and landscapes in areas such as the Old Crow flats. Permafrost melt also threatens the structural integrity of older

buildings, water supplies and waste disposal structures.

Industry

Climate change has the potential to significantly affect existing and future Yukon commercial and industrial activity, with impacts on the territory's economy.

Changes to precipitation could require costly upgrades and redesign of tailing dams and water diversion structures in the Yukon's mining industry. As well, an increase in the frost-free period could affect access to many oil and gas exploration sites, now reached via winter roads built on frozen ground. More erratic winter conditions could affect the developing film production sector, as one of the major factors in its success in the Yukon has been the ability to provide snow much earlier and much later than in other locations.

Yukon



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On the other hand, longer, warmer summers could increase the number of visitors to the Yukon and increase the growing season to enable cultivation of a wider variety of crops and increased yields.

Life on the land

Climate warming will increase the availability of food for plant-eating animals. However, changes in the timing and location of food sources, an increase in parasites and insect-borne disease, and more insect harassment may lead to declines in some animal populations. Caribou herds may be especially sensitive to these changes.

For birds in northern regions, warming may extend nesting periods, provide more food for young, and decrease chick mortality. Conversely, in the southern regions, warming may reduce breeding and forage habitats.

Forests

In central Yukon, the number of forest fires and the amount of hectares burned has been increasing since

the 1960s. This trend is expected to continue into the future, as temperatures warm and lightning storms become more frequent. Spruce Bark beetles killed almost all of the mature white spruce over some 200,000 hectares in the Alsek River corridor in Kluane National Park and in the Shakwak Valley north of Haines Junction between 1994 and 1999. A series of mild winters and springs provided good breeding conditions for the beetles, allowing them to multiply rapidly.

Water resources

Climate change will likely affect hydropower generation in the Yukon. While the net effect is uncertain, increases in the amount of water runoff may boost hydropower capacity, while possible heavy storms and sediment loading may reduce its potential. Spring flood damage could be more severe and frequent along coastal rivers and streams and throughout Yukon's interior.

Taking Action

Given the potentially serious and long-term nature of the risks associated with these impacts, the only prudent course is to take actions now to reduce the emissions that contribute to climate change. Analysis shows that the impact on Canadian jobs and economic growth associated with reducing greenhouse gas reductions can be kept modest and manageable relative to the strong growth expected over the next decade.

To give a sense of the possible order of magnitude of the impacts on industry, the estimated economic impact of implementing steps one and two in the Climate Change Plan for Canada to meet Canada's Kyoto commitments ranges from -0.4 percent to -1.6 percent of Canada's gross domestic product, dependent on various assumptions.

This is a modest impact relative to the strong economic growth expected over this period. Analysis shows job growth of 1.08 to almost 1.26 million jobs by 2010, compared to just over 1.32 million in a business as usual scenario. That means a delay in job creation of about 62,000 jobs across Canada in the year 2010. By comparison, the Canadian economy is currently creating new jobs at a rate of about 46,000 per month.

Estimates indicate that with the implementation of actions to reduce greenhouse gas emissions, the provincial gross domestic product for Canada's

northern territories in the year 2010 would grow to a level that would be about 0.04 percent less than in a business as usual scenario (combined average for the Northwest Territories, Yukon and Nunavut). Growth in new jobs would slow by approximately 0.1 percent. To put this into context, the economy in Canada's northern territories created approximately 240 jobs over the past year.

The impact on personal disposable income by 2010 would be approximately 0.19 percent less than business as usual. Electricity prices could increase by about 0.17 cents/KWh. Gasoline prices are expected to remain at their business-as-usual level in 2010.

An illustrative example of production increases for major industrial emitters in the province as a result of measures to reduce greenhouse gases (national averages) is as follows:

- **natural gas** would rise by 0.5 cents/million cubic feet, or 0.14 percent

- **electricity** – coal would rise by 0.14 cents per KWH, or by 1.94 percent
- **electricity** – gas would rise by 0.04 cents per KWH or 0.60 percent
- **electricity** – oil would rise by 0.12 cents per KWH or 1.57 percent

These economic forecasts do not reflect the significant environmental and health benefits to be gained by addressing climate change. Taking action will provide broader benefits including cleaner air, reduced health costs and other environmental and social benefits for Canadians.

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By drawing on Canadian innovation, and by ensuring that different sectors of the economy, regions and consumers play a role in taking action on climate change, the impact is more manageable for all. Working together, Canada can position itself as a strong competitor as the world moves to a new, less carbon-intensive economy.

Yukon-based companies and communities are already showing leadership in meeting the challenges of climate change¹:

- The Yukon Development Corporation is a government agency of the Yukon Territory, which has two subsidiaries: a public electric utility called the Yukon Energy Corporation, and a multi-stakeholder organization dedicated to promoting and implementing renewable energy and efficiency programs called the Energy Solutions Centre Incorporation. Using both subsidiaries, the Development Corporation is aggressively reducing diesel generation in the Territory, which currently represents 40 percent of their electricity generation.
- The Corporation currently emits 65 percent fewer emissions than in 1990, due in part to

reduced electrical load and in part to their comprehensive action plan with cost-effective alternative energy options. For instance, they decided to build a new transmission line to connect isolated, diesel-powered communities to surplus hydro-electric power in order to eliminate Yukon Energy's diesel power base-load capacity altogether and encourage a greenhouse gas emission reduction far below the six percent goal of the future.

- Despite anticipated demand increases, the Yukon Development Corporation is targeting further emissions reductions by linking excess generation capacity to existing electrical transmission systems, and adding more wind and solar generation capacity.

¹ Examples are taken from the public record.

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